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TRANSCRIPT OF CONFERENCE ON POLLUTION OF INTERSTATE WATERS OF THE NORTH PLATTE RIVER, WYOMING-NEBRASKA. TWO SESSIONS: SCOTTSBLUFF, NEBRASKA 12 SEPTEMBER 1961, AND CHEYENNE, WYOMING 21 MARCH 1962

Public Health Service,
Washington, D. C.

1962

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Transcript Of Conference

on

POLLUTION OF INTERSTATE WATERS

of the

NORTH PLATTE RIVER

WYOMING—NEBRASKA

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TWO SESSIONS

Scottsbluff, Nebraska — September 12, 1961

Cheyenne, Wyoming — March 21, 1962

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N81p/4 Transcript of conference on pollution of interstate waters of the North Platte River, Wyoming-Nebraska. Two sessions, Scottsbluff, Nebraska-Sept 12, 1961 and Cheyenne, Wyoming-March 21, 1962.

(PHS. Division of Water Supply & Pollution Control Region VI)

CONFERENCE IN THE MATTER OF POLLUTION
OF THE INTERSTATE WATERS OF THE NORTH PLATTE RIVER
WYOMING-NEBRASKA

Pursuant to notice, this conference convened at nine a.m. on Tuesday, September 12, 1961, in the City Hall, Scottsbluff, Nebraska.

CHAIRMAN OF THE CONFERENCE:

Murray Stein
Chief, Enforcement Branch
Division of Water Supply and Pollution Control
Public Health Service
Washington 25, D. C.

CONFEREES:

Herbert C. Clare
Regional Program Director
Water Supply and Pollution Control
Public Health Service, Region VI,
Kansas City, Missouri

James W. Sampson, M. D.
Director of Public Health
Wyoming Department of Public Health
State Office Building
Cheyenne, Wyoming

Arthur E. Williamson
Director, Division of Environmental Sanitation
Wyoming Department of Public Health
State Office Building
Cheyenne, Wyoming

E. A. Rogers, M. D
Director of Health
Nebraska Department of Health
Lincoln, Nebraska

Details of illustrations in
this document may be better
studied on microfiche

John S. Samson
Chairman, Nebraska Water Pollution Control
Council
Omaha, Nebraska

CHAIRMAN STEIN: The conference is open.

This conference in the matter of pollution of the interstate waters of the North Platte River, involving the States of Nebraska and Wyoming and the Public Health Service, is being held under the provisions of the Federal Water Pollution Control Act. Under the provisions of that Act, the Surgeon General of the United States Public Health Service is required to call a conference of this type when on the basis of reports, surveys, and studies he has reason to believe that pollution of interstate waters subject to abatement under the Federal Act is occurring. He also must call a conference when requested to do so by an official state water pollution control agency.

The Surgeon General has so been requested by the official state water pollution control agency of Nebraska, and in addition, on the basis of investigations, reports, surveys, and studies, he has reason to believe that interstate pollution subject to abatement under the provisions of the Federal Act is occurring. Therefore, the Surgeon General has called such a conference covering the North Platte River.

The purpose of the conference is to bring together the state water pollution control agencies, the Public Health Service, and other interested parties to review the existing situation, the progress which has been made, and to lay a basis for future action by all parties concerned and to give the states. localities, and industries an opportunity to take any remedial action which may be indicated under state and local law.

The conference mechanism is a time-tested and proved technique. It is used by many states informally in the normal conduct of business in the field of water pollution control. As long ago as 1921, the United States Supreme Court, in the famous interstate pollution case of New York against New Jersey, said, and I quote:

"We cannot withhold the suggestion, inspired by the consideration of this case, that the grave problem of sewage disposal presented by the large and growing populations living on the shores of New York Bay is one more likely to be wisely solved by cooperative study and by conference and mutual concession on the part of the representatives of the States so vitally interested in it than by proceedings in any court however constituted."

We strongly subscribe to the sentiments of the Supreme Court, and, as many of you know, we measure our success by the cases that are solved at the conference stage rather than by the court actions we bring.

Under Section 8 of the Federal Water Pollution Control Act, the Surgeon General has notified the official state water pollution control agencies in this area of the conference. These agencies are the Nebraska Department of Health and the Wyoming Department of Public Health.

Nebraska will be represented by Dr. E. A. Rogers, Director of Health of the Nebraska Department of Health, and Mr. John S. Samson, Chairman of the Nebraska Water Pollution Control Council. Incidentally, Mr. Samson is also a distinguished member of the President's Water Pollution Control Advisory Board.

The State of Wyoming will be represented by Dr. James W. Sampson, Director of Public Health, Wyoming Department of Public Health, and Arthur E. Williamson, Director, Division of Environmental Sanitation, Wyoming Department of Public Health.

The Conferee for the Public Health Service is Mr. Herbert C. Clare, Regional Program Director for the Public Health Service, with headquarters in Kansas City.

And my name is Murray Stein, and I am from Washington, D. C., headquarters of the Public Health Service.

Representatives of these official agencies are, of course, privileged to bring whomever they wish to the conference and have them participate in it. However, representatives of these state agencies and the Public Health Service constitute a conference, and under the law this is a conference between the state representatives and the Public Health Service.

The states and the Federal Government have responsibilities in dealing with interstate water pollution control problems. The Federal Water Pollution Control Act declares that the states have primary rights and responsibilities for taking action to abate and control interstate pollution. It is always, then, the policy of the Public Health Service to give full recognition to this traditional role of the states. The function of the Public Health Service is to encourage the states in these activities. However, the Public Health Service is charged by law with specific responsibilities in connection with interstate pollution control problems.

The Federal Water Pollution Control Act provides that pollution of interstate waters, whether the matter causing or contributing to such pollution is discharged directly into such waters or reaches such waters after discharge into a tributary of such waters, which endangers the public health or welfare of persons in a state other than that in which the discharge originates is subject to abatement. The procedures for abatement are carefully set forth in the Federal Water Pollution Control Act. The conference will be useful in providing a clear picture of the problem, in delineating accomplishments, and in indicating what still needs to be done to correct the problem of pollution of the interstate waters of the North Platte River.

Under the Federal Act, the Surgeon General is required at the conclusion of the conference to prepare a summary of it. The summary will be sent to all Conferees. The summary, according to law, must include the following:

1. Occurrence of pollution of interstate waters subject to abatement under the Federal Act.

2. Adequacy of measures taken toward abatement of the pollution.

3. Nature of delays, if any, being encountered in abating the pollution.

Subsequent to the holding of the conference, the Surgeon General is required to make recommendations for remedial action if such recommendations are indicated.

In the past, the Surgeon General, where pollution subject to abatement under the Federal Act was found, has always made recommendations in terms of a construction time schedule for remedial action. This time schedule has in the past always been a time schedule recommended by the Conferees when the Conferees have made such a suggestion. We can materially assist the Surgeon General, if we find it appropriate, by providing him with a unanimous recommendation for such a time schedule.

A word about the procedures governing the conduct of the conference. A record and a verbatim transcript will be made of the conference. Mrs. Virginia

Rankin is making this verbatim report for the purpose of aiding us in preparing a summary and also providing a record of what is being said and done here. We will make copies of the summary and verbatim transcript of the conference available to the official state agencies represented here. For the purpose of maintaining relationships within a region and a state, we have found that this is the best way to handle distribution. All others who want to get copies of this will, we expect, get in touch with their official state agencies. The reason for this is that we would prefer that the people who are interested in this problem follow their normal relationships in dealing with state agencies rather than coming directly to the Federal Government on these matters. This has worked successfully in the past, and we are most happy to make this material available to the states for distribution.

All the Conferees will be called upon to make statements. The Conferees in addition may call upon participants they have invited to the conference to make statements also. At the conclusion of such statements, the Conferees will be given an opportunity to comment or ask questions, and at the conclusion of the other Conferees' comments or questions I may ask a question or so too. In the past this has proved effective in developing a clear statement of the problem and in reaching agreements on equitable solutions.

At the end of all the statements and questioning, we will have a discussion among the Conferees and try to arrive at a basis of agreement on the physical facts of the situation. Then we will attempt to summarize the conference orally, giving the Conferees, of course, a right to amend or suggest modifications to the summary.

Before we go on, I would like to introduce one member of the audience, a former member of the President's Water Pollution Control Advisory Board and a distinguished figure nationally and in the region and in the state in water pollution control, Mr. Frank Long of Buffalo, Wyoming.

Mr. Long.

MR. LONG: Thank you, Murray. (Applause)

CHAIRMAN STEIN: I wonder if we could go down the Conferees and see if you want to introduce anyone from the audience now or you would prefer to wait until later.

Wyoming.

DR. SAMPSON: Mr. Long, of course. Mr. S. A. Christensen, from Evanston, who is a member of our council; Mr. Cliff Bosely is representing Mr. Jiacoletti, who is our Game and Fish Director; Mr. Schmidt is with the Resources Board and also from Wyoming.

MR. SCHMIDT: Bureau of Land Management.

DR. SAMPSON: He is with the Bureau of Land Management.

If there are some others from Wyoming that I have overlooked, would you please call attention to yourselves.

MR. LONG: Mr. Croghan of Torrington.

DR. SAMPSON: Mr. Croghan from Torrington, Holly Sugar.

CHAIRMAN STEIN: And from Nebraska, are there any folks you want to introduce?

MR. SAMSON: I want to introduce a member of our council from Nebraska, the General Superintendent of the Great Western Sugar Company, Mr. Harold Burk. Mr. Burk, will you raise your hand. And associated with him, and I think probably his boss, is Mr. Lloyd Jensen from Denver, from the Great Western Sugar Company, a good friend of mine. And Senator Terry Carpenter, formerly of the unicameral legislature, from Gering.

Let's see, who else is here from Nebraska? Whom have I missed?

MR. AGEE: My name is Agee. I am representing Mr. Steen, State Game Commissioner.

MR. SAMSON: Fine. I am glad you identified yourself.

Mr. Burk, is there anybody else here from Nebraska whose presence should be made known?

From Morrill, Nebraska, Mr. Gilbert, admitted to practice law at Morrill and in the law practice there.

CHAIRMAN STEIN: Do you have any, Dr. Rogers?

DR. ROGERS: Yes. Mr. George Myers, a member of our State Board of Health, is here. He is a pharmacist practicing in Gering, Nebraska. And Mr. Tom Vanderhoof, the Director of our West Nebraska Branch State Laboratory, is here. And also the Director of Sanitation of the Scotts Bluff County Health Department, Mr. Oscar Wiberg.

Anyone I have missed?

CHAIRMAN STEIN: How about you, Mr. Clare?

MR. CLARE: Yes, I would like to introduce some of our associates.

The state line here between Wyoming and Nebraska is also an interregional line, so Region VIII of the Public Health Service is interested in this conference as is Region VI, which I represent, so I would like to introduce the men who are here from Region VIII. Mr. Kaarlo Nasi is Regional Program Director, Water Supply and Pollution Control, Public Health Service, Denver. And with Kaarlo are Mr. Joe Fitzpatrick and Mr. Martin Bauer, of the Water Quality Section.

I also, I think, should introduce some of our associates from Kansas City, Don Townley and Dick Hunsinger, who are in our Enforcement Section there. Incidentally, these men are helping with local arrangements, and they will pass around registration sheets, which we hope each of you will put your name on this morning.

Others with the Public Health Service you will hear from later, I believe, with the exception of Mr. A. D. Sidio, engineer from our Sanitary Engineering Center at Cincinnati.

I believe that is it. We will hear from Dr. Neel and Mr. Kittrell later.

CHAIRMAN STEIN: Thank you.

MR. SAMSON: Pardon me, Mr. Stein, but I saw the City Manager here a few moments ago--as a matter of fact, I visited with him--Mr. Leikvold. Is he here? It is through his help and courtesy that we have these commodious quarters. If he is here, I sure would appreciate it if he would stand up and be identified.

MAYOR WILLIAM E. NICHOL: He stepped out for a few minutes. He will be back.

MR. SAMSON: And the Mayor of Scottsbluff. Your name, please?

MAYOR NICHOL: Nichol.

MR. SAMSON: Mayor Nichol. It is also through his assistance that we have these fine quarters.

Thank you.

CHAIRMAN STEIN: Thank you, Mr. Samson.

Before we go on, we would like to ask those who have a prepared statement to come up toward the front on my left when they give it. If your statement is written and you do have a copy of it, it will be appreciated if you can give a copy of this to Mrs. Rankin before you give it. This will facilitate the taking of the transcript. As you know, this can be quite a chore before the day is over.

With that, we will proceed with the Public Health Service statement. Mr. Clare.

MR. CLARE: As Chairman Stein has indicated, the Public Health Service is one of three official water pollution control agencies that is interested in the water quality problem of the North Platte River, the interstate stream between Wyoming and Nebraska, and also as he has indicated, of course, the States of Wyoming and Nebraska are also interested.

I think it can be said that probably no interstate stream has received as much attention in the matter of studies and consideration of the water quality problem as has the North Platte. I recall that I attended a meeting of the Missouri Basin Inter-Agency Committee at Casper this spring, and the development of the North Platte River was the principal topic of discussion at that time. It is a river that is used extensively for many different things, especially for irrigation and in some stretches, of course, for recreation. So the stream has been studied intensively. This started, oh, some ten years ago, under an agreement between the Bureau of Reclamation and the Public Health Service, and the study was reported quite in detail at that time. Since then there have been follow-up studies and we have a great deal of basic information on the condition of the stream and are in a position to measure the changes of water quality in the North Platte.

These studies, I must say, were made cooperatively by the States of Wyoming and Nebraska and the Public Health Service. Of course, Colorado is interested in the North Platte also, because some of the headwaters are in the State of Colorado There has been a comprehensive report written on the North Platte by the three states and the Public Health Service.

There are such names as Neel and Hopkins and others that have written papers. There has been a study at Bayard, the method of waste disposal at the sugar plant at Bayard, that has been extensively reported, and information on these studies will be given, at least in summary, by Public Health Service men here today.

So with those remarks, I think, Mr. Chairman, that we can call Mr. Kittrell to give a presentation of the pollution of the interstate waters of the North Platte River, Wyoming-Nebraska.

Mr. Kittrell, incidentally, is from our Sanitary Engineering Center, Public Health Service, at Cincinnati. He is with the Field Operations Section and is the Chief Engineer for the Field Studies Section.

MR. KITTRELL: I have something of a problem here, which is common in most of these, and that is trying to arrange my charts so that both the Conferees and the audience can see them.

Pollution of the North Platte River in the reach from Torrington, Wyoming, to Bridgeport, Nebraska, was investigated during 1949 and 1950. This was a cooperative undertaking of the water pollution control agencies of the States of Nebraska and Wyoming and of the U. S. Public Health Service, Missouri Drainage Basin Office.

The June 1949 study revealed excessive bacterial contamination by sewage, with the highest densities below Scottsbluff and downstream to Bridgeport. No serious effects of organic wastes were indicated by the biochemical oxygen demand (B.O.D.) and dissolved oxygen (D.O.) data. During June, however, stream flows were relatively high, and no final conclusion could be drawn from the 1949 data regarding probable effects of organic pollution when stream flows dropped to a minimum in summer months.

The data for November 1950, when the five beet sugar plants in the area were in operation, indicated gross pollution throughout much of the Torrington-Bridgeport reach of the North Platte. Bacterial contamination was much higher than in June, and high B.O.D. levels and significant oxygen depletion occurred below both Torrington, Wyoming, and the Scottsbluff-Gering, Nebraska, area.

The report containing the results of those studies recommended that sewage and industrial waste treatment plants be provided by essentially all of the towns and major industries involved.

Subsequently Torrington has provided stabilization ponds for its sewage, and the Great Western Sugar Company plant at Bayard, Nebraska, has provided facilities for broad field disposal of its wastes. The other four beet sugar plants have undertaken various measures, many of them within their processes, designed to reduce their wastes.

In November and December 1960 the Public Health Service conducted stream studies to determine present stream quality during the beet sugar campaign. This report deals with the bacteriological, chemical, and physical data obtained during the December study. The biological results of the November study will be presented separately.

THE AREA

The reach of the North Platte River covered by the December study extended from Torrington, Wyoming, to Bridgeport, Nebraska, a distance of 67 miles by river. This reach is shown on Chart 1.

The concentrations of sewered communities and waste-producing industries in this area are greater than those along any other comparable reach of the North Platte.

One town in Wyoming ana fifteen in Nebraska are situated on or near this reach of the river. Of these eleven are sewered.

There also are fifteen industrial plants discharging wastes directly to this reach of the river, with the greatest concentration in the Scottsbluff-Gering, Nebraska, area. The industries reflect the agricultural economy of the surrounding area, with all but one processing agricultural products such as sugar beets, vegetables, livestock and poultry, or milk. The agriculture is largely dependent on use of the North Platte River water for irrigation.

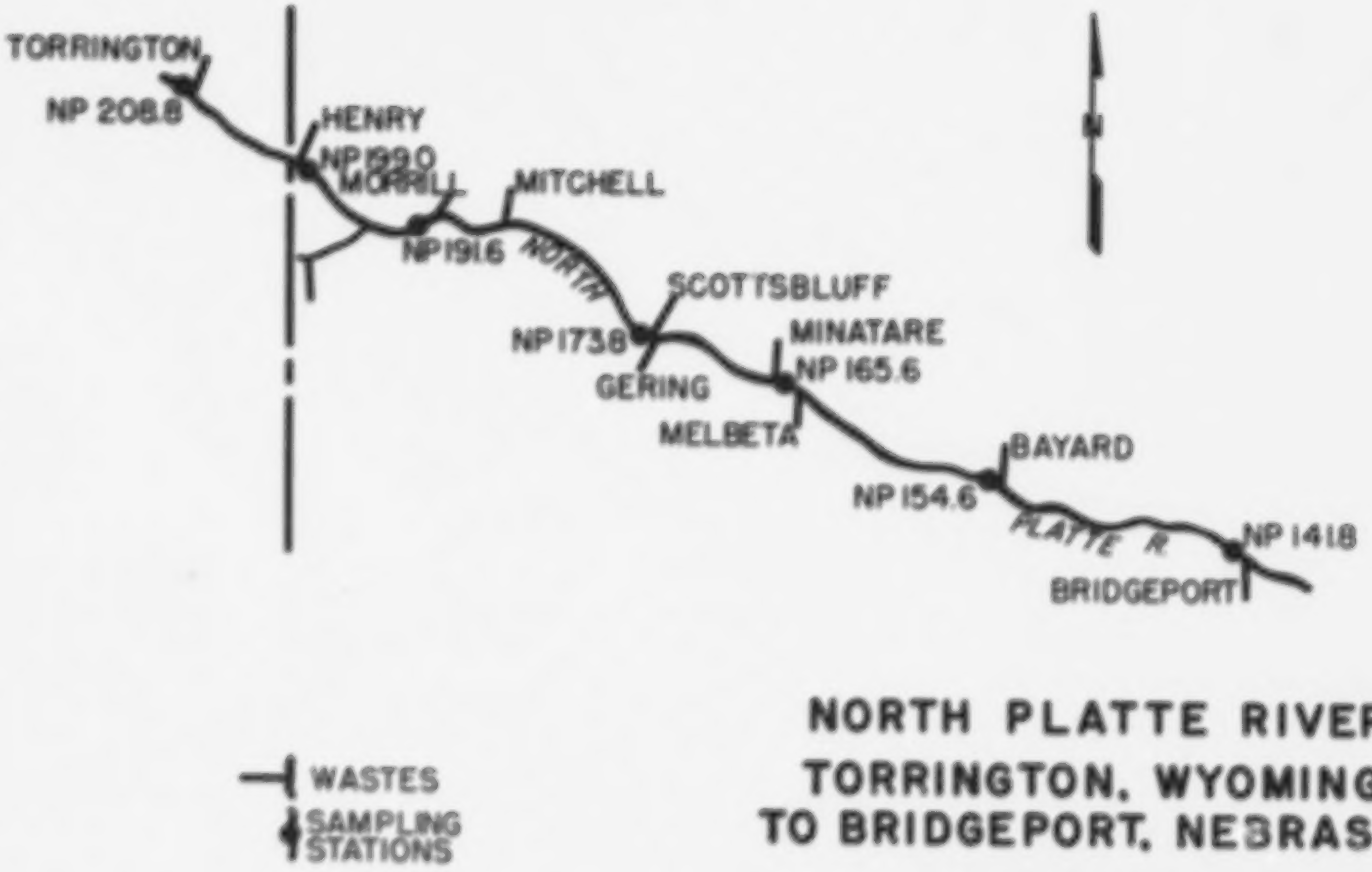
WATER USES

The area adjacent to this reach of the North Platte is a gridwork of canals drawing water from the river for irrigation and drains for returning flow from the irrigated fields to the river. There are four diversion dams, and at least sixteen canals and twenty-eight drains are directly connected to the 67 miles of river. In 1950 there were about 376,000 acres of irrigated area in more than 3,000 farms in the three counties through which this reach of the river flows. The counties are Goshen in Wyoming and Scotts Bluff and Morrill in Nebraska.

The Holly Sugar Company plant at Torrington takes a portion of its water supply from the North Platte and the remainder from wells. Other industrial plants downstream, in Nebraska, depend principally on wells and surface drains for their water supplies. The river water generally is preferable to underground water in this area because of high hardness content of the ground waters.

There is no known use of the river for domestic purposes, but in many areas of the country it is common practice to draw water from irrigation canals for farm water supplies. It is probable that such use is made of the numerous canals and drains of the North Platte irrigation system. It also is quite probable that the system is used for livestock watering. Information is needed on these two potential uses.

Fish are taken from the irrigation ditches, and the river itself has potential as a fishery. This potential resource of the river and the impact


N
TORRINGTON
NP 208.8
HENRY
NP 199.0
MORRILL
MITCHELL
NP 191.6
NORTH
SCOTTSBLUFF
NP 173.8
GERING
MINATARE
NP 165.6
MELBETA
BAYARD
NP 154.6
PLATTE R.
NP 141.8
BRIDGEPORT
WASTES
SAMPLING STATIONS

NORTH PLATTE RIVER
TORRINGTON, WYOMING,
TO BRIDGEPORT, NEBRASKA
CHART I

of pollution on it will be covered in a separate presentation.

The swift, shallow river has only limited potential for boating and swimming, but wherever people have access to water there almost inevitably is some boating and swimming, and this reach of the North Platte probably is no exception. Information on this potential also is needed.

The river is heavily used for waste disposal by both municipalities and industries, many of which have either inadequate or no facilities for reduction in sewage and industrial wastes before discharge to the stream.

SOURCES OF WASTES

Table 1 -- and I will not read this table, but I do ask that it be entered in the transcript.

CHAIRMAN STEIN: Would you want this and other tables to be entered?

MR. KITTRELL: Yes, all tables contained in the report referred to.

CHAIRMAN STEIN: Without objection, that will be done.

MR. KITTRELL: Table 1 lists sewered communities from Torrington, Wyoming, to Bridgeport, Nebraska, which are sources of contamination of river water by sewage bacteria.

Table 2 lists sources of organic wastes discharged to this reach of the North Platte. This list includes both municipal sewerage systems and industrial plants.

The basic information for these tables was taken from the U. S. Public Health Service 1957 Inventory of Municipal and Industrial Waste Facilities.

And right at this point, I would like to insert that I find since arriving here that both the inventory and I had overlooked one town that probably is the fastest-growing town in the area, and that is Terrytown, which is located between Scottsbluff and Gering; in fact, it is just north of Gering south of the North Platte River Terrytown discharges raw sewage from a sewered population of somewhere between 1,000 and 2,000. I don't have exact information on this, but this should be included or should be covered in this report and adjustments will be made to allow its insertion before the report goes into the transcript. *

SEWAGE

Table 1 includes data on both the sewered populations of the municipalities involved and estimated bacterial population equivalents (BPE) of the sewage as discharged to the river. Where the BPE value is less than the corresponding sewered population, the difference represents the reduction in potential bacterial contamination resulting from treatment For example, Torrington, Wyoming, with a sewered population of 3,500, discharged an estimated BPE of zero to the stream. Torrington had installed stabilization ponds for treatment of the sewage previous to the 1960 river study. As the

* Tables 1 and 2 have adjustments for Terrytown sewage.

TABLE 1

SOURCES OF SEWAGE DISCHARGED TO STREAM

SOURCE	SEWERED POPULATION	BACTERIAL POPULATION EQUIVALENT TO STREAM	PERCENT OF TOTAL DISCHARGE TO STREAM
Wyoming			
Torrington	3,500	0*	0.0
Holly Sugar Co.	270	135	0.7
Nebraska			
Henry	80	80	0.4
Lyman	350	350	1.9
Morrill	600	600	3.3
Mitchell	1,800	1,800	10.0
Scottsbluff	9,000	9,000	50.0
Terrytown	1,500**	1,500	8.3
Gering	2,000	1,000	5.6
Minatare	800	800	4.4
Melbeta	80	80	0.4
Bayard	1,700	1,700	9.4
Bridgeport	1,000	1,000	5.6
	22,680	18,045	100.0

* No overflow from Torrington sewage stabilization ponds during December, 1960, study.

** Estimated sewered population.

TABLE 2

SOURCES OF ORGANIC WASTE DISCHARGED TO STREAMS

SOURCE	B.O.D. POPULATION EQUIVALENT *		PERCENT OF TOTAL
	INDIVIDUAL SOURCE	TOTAL FOR AREA	
Wyoming			
Torrington	0	370,000	27.17
Holly Sugar Co.	370,000		
Nebraska			
Henry	800	1,300	0.10
Platte Valley Poultry	500		
Lyman	350	350	0.03
Morrill	840	840	0.06
Mitchell	2,600	158,600	11.65
Great Western Sugar Co.	156,000		
Scottsbluff	12,520	646,950	47.51
Co-op Cannery	4,000		
Co-op Oil Refinery	1,200		
Flicker Packing Co.	550		
Great Western Sugar Co.	623,000		
H & B. Packing Co.	720		
Hersch Packing Co.	1,160		
Idlewild Dairy	1,600		
Scottsbluff Rendering	2,200		
Terrytown	1,500	1,500	0.11
Gering	1,400	130,500	9.58
Great Western Sugar Co.	96,000		
Miller Packing Co.	100		
Swift & Co.	33,000		
Melbeta	80	80	0.01
Minatare	800	800	0.06
Bayard	1,700	49,700	3.65
Great Western Sugar Co.	48,000		
Bridgeport	1,000	1,000	0.07
TOTALS	1,361,620	1,361,620	100.00

* Data from U. S. Public Health Service 1957 Inventory of Municipal and Industrial Waste Facilities, with exception of PE for Torrington municipal discharge, from which there was no discharge during December, 1960, study.

ponds had not filled sufficiently to overflow to the river during the 1960 study, there was no discharge of sewage during that period.

The sewage from the 270 employees of the Holly Sugar Company at Torrington passed through a septic tank before discharging to the river. It is estimated that this treatment reduced the bacterial content of the sewage by fifty percent, to a BPE of 135.

Similarly, the Gering, Nebraska, sewage was passed through a septic tank before discharge to the stream, and the bacterial contamination from the 2,000 sewered population was reduced to an estimated BPE of 100,000.

MR. CLARE: Correction. 1,000.

MR. KITTRELL: Of 1,000. Excuse me. Thank you, Herb.

All other communities discharged sewage without treatment, and the sewered population and the BPE of each were the same. Melbeta, Nebraska, had a septic tank, but it was reported not in use.

The potential bacterial contamination from the total 21,200 sewered population in the entire area was reduced about twenty-two percent by treatment to a BPE of 16,500. These figures will, of course, have to be adjusted when Terrytown is added to the list. More than sixteen percent of the total reduction was at Torrington.

Scottsbluff has received approval for a Public Health Service grant for construction of a sewage treatment plant.

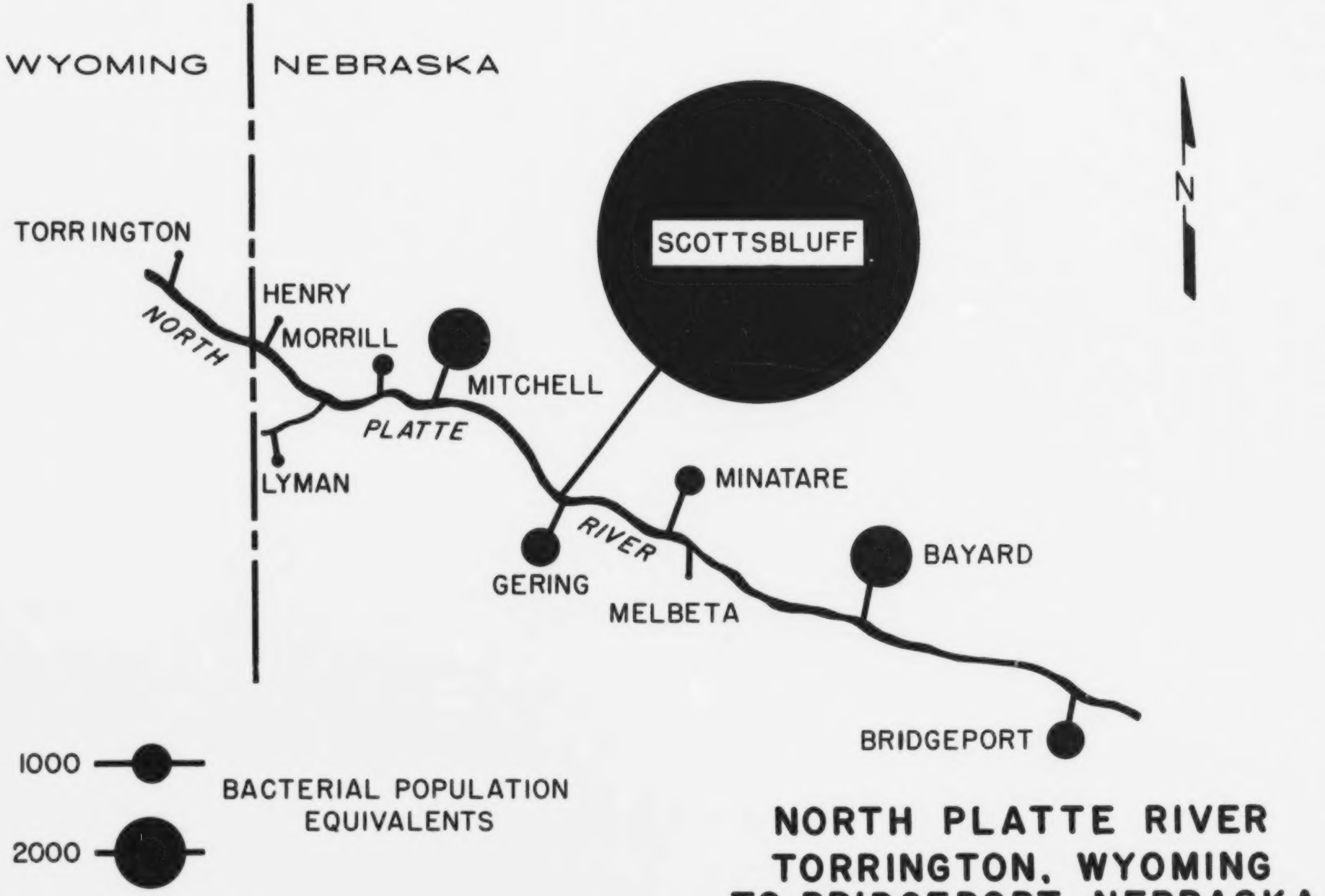
Chart 2 represents the sources of sewage discharged to this reach of the North Platte River. The circles indicate the relative contributions of sewage bacteria from the various sources, with the diameter of the circle at each source in proportion to contributions from all other sources.

Of the 16,500 total bacterial population equivalent, less than one percent was discharged from the Holly Sugar Company plant at Torrington in Wyoming. All other sewage was discharged from communities in Nebraska. Scottsbluff sewage discharge accounted for more than one-half of the total BPE. Bayard and Mitchell accounted for about ten percent each, Gering and Bridgeport for six percent each, and the other five communites between 0.5 and 4.8 percent.

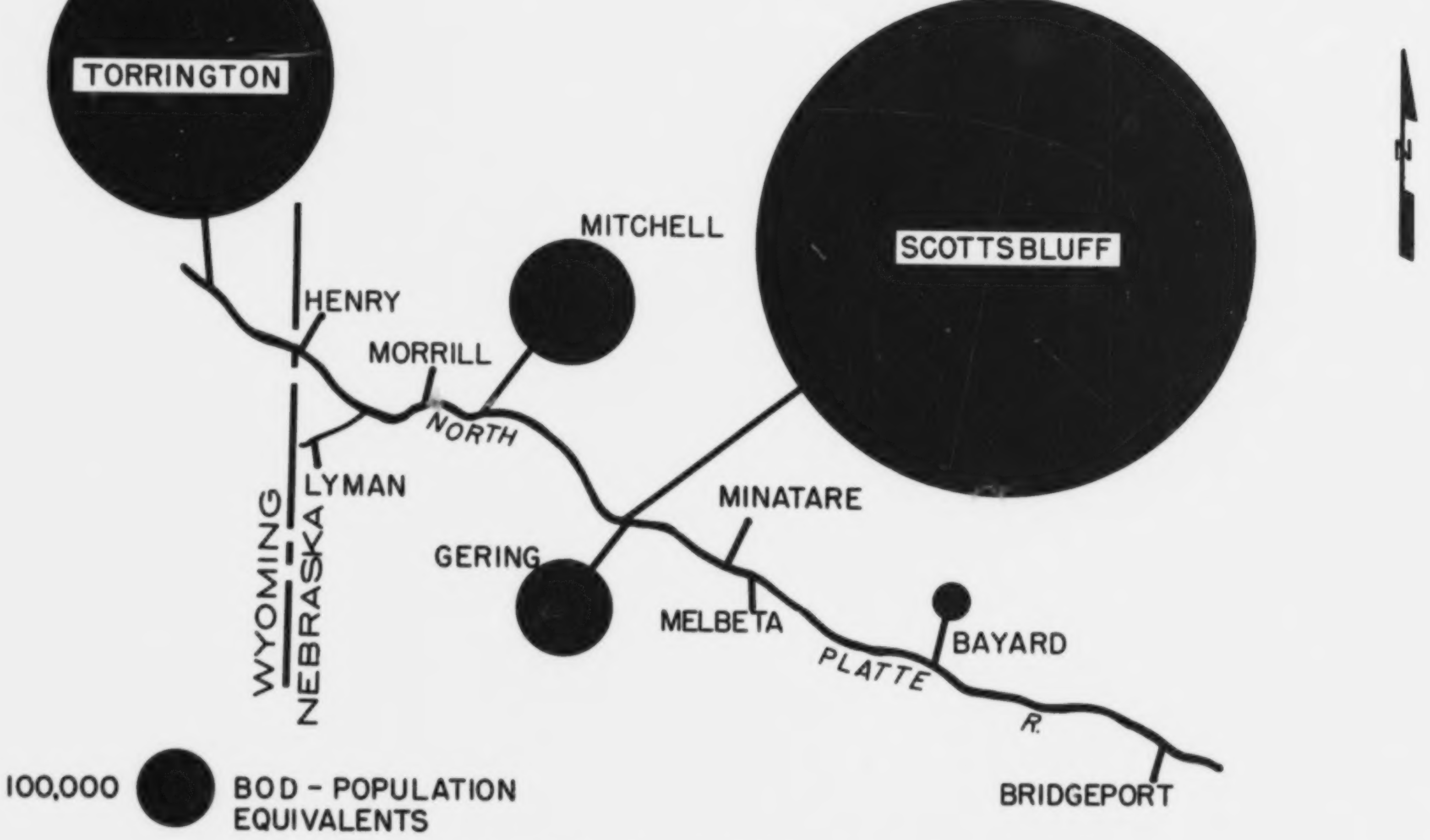
ORGANIC WASTES

Table 2 gives estimates of the oxygen demanding strength of both sewage and industrial wastes discharged to the North Platte River from Torrington to Bridgeport. The oxygen demand strength is expressed in population equivalents (PE), with one PE equal to the oxygen demand exerted by the sewage from one person. The table includes the PE from each source and also a total for all wastes, both sewage and industrial, from each community.

Chart 3 presents the relative population equivalent from each community. Here again the diameter of each circle is in proportion to the population equivalent for all other sources in the area.


WYOMING
NEBRASKA
N
TORRINGTON
HENRY
MORRILL
MITCHELL
SCOTTSBLUFF
NORTH
PLATTE
RIVER
LYMAN
MINATARE
GERING
MELBETA
BAYARD
BRIDGEPORT
1000
2000
BACTERIAL POPULATION EQUIVALENTS

NORTH PLATTE RIVER
TORRINGTON, WYOMING
TO BRIDGEPORT, NEBRASKA
SOURCES OF SEWAGE
CHART 2


TORRINGTON
SCOTTSBLUFF
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MITCHELL
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MORRILL
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LYMAN
WYOMING
NEBRASKA
MINATARE
GERING
MELBETA
BAYARD
PLATTE
R.
BRIDGEPORT
100,000
BOD - POPULATION EQUIVALENTS

NORTH PLATTE RIVER
TORRINGTON, WYOMING TO BRIDGEPORT, NEBRASKA
SOURCES OF ORGANIC WASTES
CHART 3

The total population equivalent for the entire area was 1,360,000. Of this total, a little more than one quarter was from the Holly Sugar Company at Torrington. Nearly one-half was from Scottsbluff and its associated industries Mitchell and its industry accounted for nearly twelve percent, Gering and its industries for nearly ten percent, and Bayard and its industry for less than four percent. Contributions from the other six communities and their industries ranged between 0.01 and 0.10 percent.

The five beet sugar plant wastes accounted for 1,293,000 of the 1,360,000 total population equivalent. Thus the beet sugar plants, when in operation, accounted for ninety-five percent of the total organic wastes discharged to this reach of the river. One plant alone, the Great Western Sugar Company plant at Scottsbluff, accounted for nearly forty-six percent of the total. The Holly Sugar Company plant, with a little more than twenty-seven percent, was the second largest contributor of organic wastes. The Great Western Sugar Company plants at Mitchell contributed 11.5 percent, at Gering 7.1 percent, and at Bayard 3.5 percent.

MR. SAMSON: Mr. Kittrell, may I interpose a question here?

MR. KITTRELL: Yes.

MR. SAMSON: If Terrytown were interposed on Chart No. 3, would you have any opinion at all about the size of the circle as compared to those two circles there on your chart, that is the B.O.D. population equivalent?

MR. KITTRELL: It would be almost invisible. This circle right here represents 100,000 population equivalent. Terrytown would have between 1,000 and 2,000 according to the information I have. It would be something like--

MR. SAMSON: That is as a source of organic waste?

MR. KITTRELL: Yes.

CHAIRMAN STEIN: It probably would be more significant on the previous chart in proportion, wouldn't it?

MR. KITTRELL: Oh, yes, on the previous chart Terrytown would be much larger, on Chart No. 2.

CHAIRMAN STEIN: Just to clarify that, would you --

MR. SAMSON: That is on Chart No. 2?

MR. KITTRELL: As a source of bacterial contamination, Terrytown would be much larger. Well, it would be between these two circles here. One of these represents 1,000 bacterial population equivalent, the other 2,000.

DR. SAMPSON: Minatare, is it the same size? Is one of those towns the same size?

CHAIRMAN STEIN: Minatare and Gering, are they the same?

MR. KITTRELL: Gering is 1,000. These two circles here show you sizes. This is 1,000 and this is 2,000, so it would be between these two circles.

DR. SAMPSON: I see.

MR. SAMSON: Thank you very much.

MR. KITTRELL: IRRIGATION RETURN WATER

Use of water for irrigation generally results in considerable increase in mineral content of the water. Although data are not available to permit adequate evaluation of this factor in the reach of the North Platte under consideration, it is almost inevitable that there is a marked increase in mineralization of the river during the irrigation season.

During a biological survey in August 1950 alkalinity was determined at points along most of the length of the North Platte. The results showed an increase in alkalinity from about 120 milligrams per liter above the Torrington to Bridgeport reach to a maximum of 290 milligrams per liter below the reach. This is an indication of one of the effects of irrigation return water, but information would be needed on hardness, sodium, calcium, magnesium, sulfates, and chlorides for full evaluation of this effect.

EFFECTS ON WATER QUALITY AND USES

A study of the effects of pollution on chemical, bacterial, and physical quality of water was conducted during the period December 7 through 13, 1960.

Samples were collected once daily at each of the seven stations shown on Chart 1. The stations were Torrington, Henry, Morrill, just above Scottsbluff, Minatare, Melbeta, Bayard, and Bridgeport.

MR. GEORGE: Sir, may I ask a question? Where was that sample taken--

CHAIRMAN STEIN: Pardon just one moment. If you are going to ask questions from the floor, we suggest you identify yourself for the record.

MR. GEORGE: I am W. L. George, Mayor of Bayard.

I just want to know if he knew where the sample was taken at Bayard. Was it on the river?

MR. KITTRELL: The sample was taken from the bridge just south of Bayard, and I believe you went with me to that bridge and pointed out the drainage ditch through which the--

MR. GEORGE: That would be on the Great Western Sugar Company's drain?

MR. KITTRELL: On the Great Western Sugar Company's drain just above and on the north side of the river at this bridge where we sampled? Incidentally, we sampled far enough out across the river that we were away from the influence of the Holly Sugar Company plant waste at that point.

DR. NEEL: You mean Great Western Sugar Company.

MR. KITTRELL: I am sorry, Great Western Sugar Company. Yes.

Samples were collected once daily at each of the seven stations shown on Chart 1. Determinations on the samples included temperature, pH, alkalinity, D.O., B.O.D., total suspended solids, and coliform bacteria. In addition, daily samples were collected from the Holly Sugar Company waste discharge for determination of temperature and total and fixed suspended solids.

Provisional data on stream flow at the sampling stations were obtained from the U. S. Geological Survey.

The results of this study are presented in the following table. And this table also I ask to be entered into the transcript, but I will not read it. (Table 3)

COLIFORM BACTERIA

Chart 4 presents information on the average most probable numbers (MPN) of coliform bacteria found at the sampling stations. The heights of the bars indicate the densities of coliforms at the stations.

Bacterial contamination of the North Platte above Torrington was quite low, with an MPN of only 214 per 100 milliliters. Below the Holly Sugar Company plant sewage and industrial waste discharge, the coliform MPN rose to 329,000 per 100 milliliters near the state line.

At the next station downstream above Mitchell, Nebraska, the coliform MPN dropped to 132,000 per 100 milliliters. Below the Mitchell sewage discharge and the Great Western Sugar Company industrial waste discharge the MPN increased to 704,000 per 100 milliliters. This density, and all others downstream below this station, included some residual of the coliform bacteria from the Holly Sugar Company waste discharge.

The Scottsbluff-Gering area, with raw and partially treated sewage discharges and wastes from the numerous industries, including two Great Western Sugar Company plants, the Swift and Company plant, and several smaller meat processing plants, is the largest source of coliform bacteria along this reach of the North Platte. Below the area the MPN increased to 815,000 per 100 milliliters, the highest value found during the study. This value was 3,800 times the MPN of the relatively uncontaminated stream above Torrington.

Downstream from this point the coliform densities dropped to 537,000 per 100 milliliters just above Bayard and to 279,000 at Bridgeport, despite the discharge of sewage from Minatare, Melbeta, and Bayard, and the treated wastes from the Great Western Sugar Company plant at Bayard.

The principal contributors to the extremely high densitites of coliform bacteria throughout the river reach from below Torrington to Bridgeport are the raw and partially treated sewage, the beet sugar wastes, and the

TABLE 3

NORTH PLATTE RIVER STREAM SURVEY
WYOMING-NEBRASKA
DECEMBER, 1960
RESULTS OF ANALYSIS

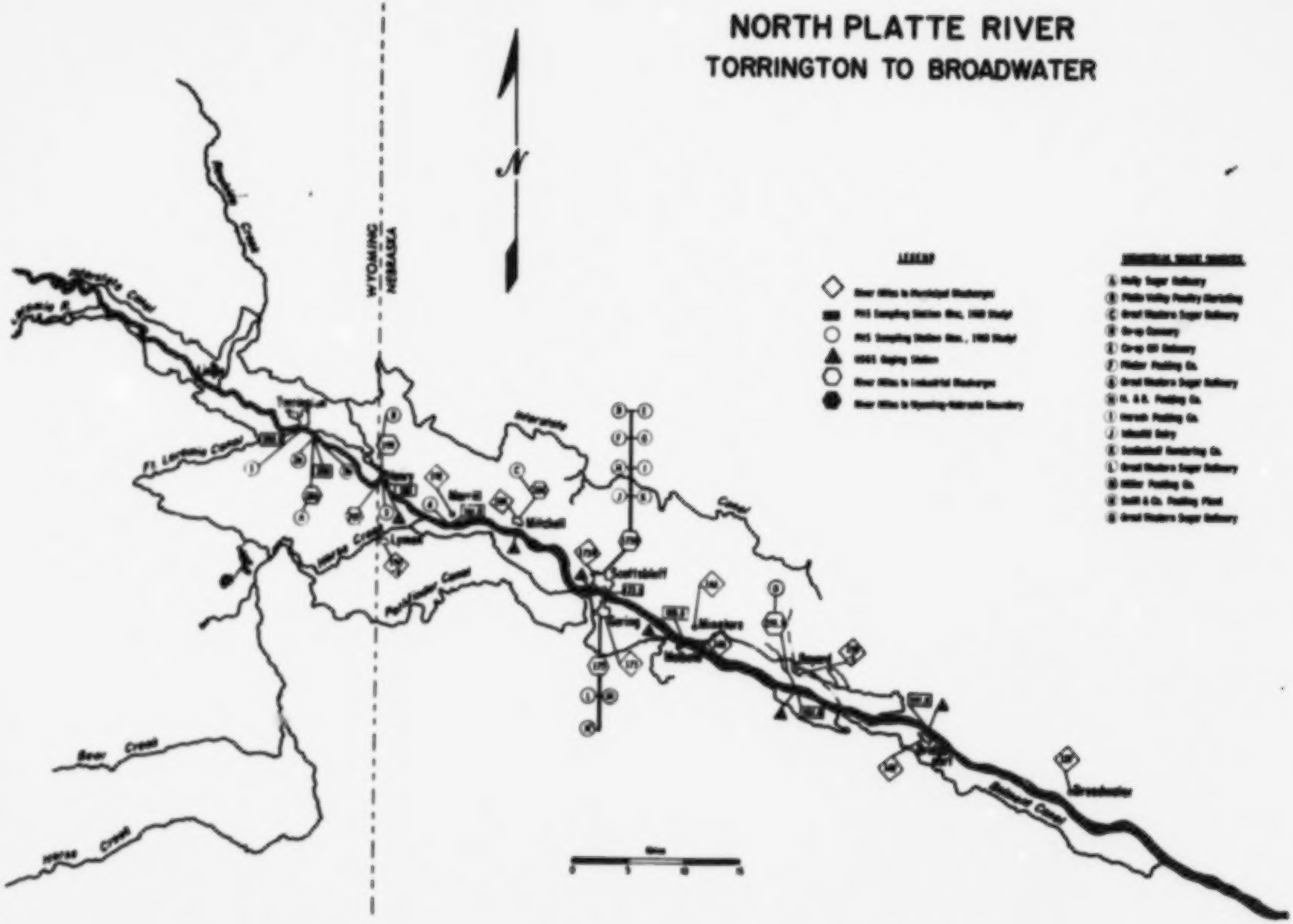
Station	Date Dec 1960	Time Collected	Flow cfs	Temp. °C.	pH	Alkalinity P(as CaCO3)	Alkalinity Total	Dissolved Oxygen mg/l.	Dissolved Oxygen % Sat.	BOD mg/l	BOD lbs/day	Total Suspended Solids mg/l	Total Suspended Solids lbs/day	Coliform MPN/100	Fixed Suspended Solids mg/l	Fixed Suspended Solids lbs/day
ES-1	7	1:45 PM		34								7,940			7,100	
	8	8:20 AM		34								4,700			4,140	
	9	10:30 AM		41								2,980			2,520	
	10	7:15 AM		35								536			528	
	11	7:40 AM		36								724			508	
	12	1:15 AM		38								1,860			1,460	
	13	9:40 AM		35								3,100			2,660	
Avg.				36								3,163			2,702	
NP-206.8	7	1:45 PM	278	2	8.2		216	11.40	94	1.11	1,666	8.0	12,000	91		
	8	8:20 AM	278	0	8.0		218	11.33	89	1.19	1,786	2.2	3,300	91		
	9	10:30 AM	278	0	8.2		216	9.49	75	1.13	1,696	9.0	13,500	< 36		
	10	7:15 AM	278	0	8.0		217	11.01	87	1.30	1,951	4.83	7,250	230		
	11	7:40 AM	278	0	8.1		214	11.06	87	2.04	3,062	4.5	6,750	430		
	12	1:15 PM	278	2	8.3	2.2	223	11.60	96	1.39	2,086	17.8	26,720	230		
	13	9:40 AM	278	0	8.2		216	11.30	89	1.71	2,567	8.5	12,760	430		
Avg.			278	0.5	8.1	0.3	217	11.03	88	1.41	2,116	7.83	11,750	214		
NP-199	7	1:15 PM	290	1	8.0		251	8.75	72	59.8	93,650	54.5	85,350	93,000		
	8	8:50 AM	270	0	8.0		249	8.58	68	50.7	73,920	49.0	71,440	460,000		
	9	11:04 AM	280	0	8.1		244	8.71	69	49.0	74,090	51.7	78,170	75,000		
	10	7:05 AM	280	0	8.0		249	8.51	67	63.0	95,260	48.5	73,330	240,000		
	11	8:10 AM	280	0	8.0		244	8.41	66	56.0	84,670	47.0	71,060	240,000		
	12	1:45 PM	275	2	8.2		254	8.44	71	63.0	93,560	45.0	66,820	93,000		
	13	9:20 AM	270	0	8.1		246	8.57	68	59.6	86,900	46.8	68,230	1,100,000		
Avg.			278	0.4	8.1		247	8.57	69	57.3	86,000	48.9	73,500	329,000		
NP-191.6	7	12:45 PM	328	0	8.1		243	9.39	74	22.8	40,380	146	258,600	43,000		
	8	9:20 AM	328	0	8.0		243	9.49	75	19.4	34,360	169	299,300	43,000		
	9	11:20 AM	328	0	8.1		248	11.33	89	23.0	40,730	150	265,600	93,000		
	10	6:45 AM	328	0	8.0		242	9.50	75	24.2	42,860	104	184,200	460,000		
	11	8:45 AM	328	0	8.1		238	9.44	74	20.8	36,840	150	265,600	93,000		
	12	2:10 PM	328	2	8.2		242	9.34	78	31.3	55,430	104	184,200	43,000		
	13	9:00 AM	328	0	8.1		240	9.42	74	23.5	41,620	106	187,700	150,000		
Avg.			328	0.3	8.1		242	9.70	77	23.6	41,740	133	235,000	132,000		

TABLE 3

NORTH PLATTE RIVER STREAM SURVEY (CONTINUED)
WYOMING-NEBRASKA
DECEMBER, 1960
RESULTS OF ANALYSIS

Station	Date Dec. 1960	Time Collected	Flow cfs	Temp. °C.	pH	Alkalinity P(as CaCO$_3$)	Alkalinity Total	Dissolved Oxygen mg/l.	Dissolved Oxygen % Sat.	BOD mg/l	BOD lbs/day	Total Suspended Solids mg/l	Total Suspended Solids lbs/day	Coliform MPN/100	Fixed Suspended Solids mg/l	Fixed Suspended Solids lbs/day
NP-173.8	7	3:45 PM	466	0	8.1		290	8.47	67	25.9	65,160	133	334,600	150,000		
	8	11:00 AM	450	0	8.1		295	8.60	68	22.2	53,950	161	391,200	930,000		
	9	9:20 AM	450	0	8.1		293	8.30	65	19.0	46,170	152	369,400	---		
	10	8:05 AM	442	0	8.0		286	8.21	64	17.8	42,470	104	248,100	2,400,000		
	11	12:30 AM	446	1	8.1		288	8.10	66	21.2	51,050	130	313,000	930,000		
	12	2:45 PM	438	1	8.2		296	8.25	67	24.8	58,650	132	312,200	93,000		
	13	8:20 AM	434	0	8.1		283	8.44	66	24.7	57,870	86	201,500	430,000		
Avg.			447	0.3	8.1		290	8.34	66	22.2	53,620	128	310,000	704,000		
NP-165.6	7	9:15 AM	669	0	8.3	4.4	370	6.28	49	48.2	174,100	267	964,700	1,100,000		
	8	12:30 PM	701	1	8.1		365	5.80	47	40.6	152,900	272	1,029,500	750,000		
	9	8:50 AM	701	0	8.2		387	5.00	39	42.9	162,400	302	1,143,100	---		
	10	8:45 AM	683	0	8.1		378	5.07	39	41.5	153,000	263	969,900	430,000		
	11	12:05 PM	687	2	8.1		380	4.71	39	46.0	170,700	270	1,001,700	930,000		
	12	11:05 AM	683	0	8.3	0.6	402	5.67	44	46.1	170,000	335	1,235,500	750,000		
	13	7:55 AM	678	0	8.3	2.0	375	5.55	44	59.9	219,300	280	1,025,100	930,000		
Avg.			686	0.4	8.2	1.0	379	5.44	43	46.4	171,800	284	1,052,800	815,000		
NP-154.6	7	10:00 AM	805	0	8.4	1.6	341	6.90	54	28.2	122,600	175	760,700	240,000		
	8	1:05 PM	805	1	8.2		384	6.04	49	28.8	125,200	284	1,234,500	150,000		
	9	8:20 AM	805	0	8.2		372	5.41	43	24.3	105,600	284	1,234,500	930,000		
	10	9:10 AM	805	0	8.1		365	5.37	42	24.6	106,900	268	1,165,000	930,000		
	11	11:35 AM	805	1	8.2		369	4.21	34	> 37.1*	-	240	1,043,300	930,000		
	12	10:30 AM	805	0	8.1		382	5.63	44	31.5	136,700	270	1,173,700	430,000		
	13	7:30 AM	805	0	8.3	2.0	382	5.31	42	37.9	164,800	244	1,060,700	150,000		
Avg.			805	0.3	8.2	0.5	371	5.55	44	29.3	127,300	252	1,096,000	537,000		
NP-141.8	7	10:30 AM	943	0	8.2		330	8.81	69	16.0	81,470	143	728,100	93,000		
	8	1:40 PM	952	0	8.2		436	8.06	64	29.3	150,600	458	2,354,100	75,000		
	9	7:45 AM	972	0	8.1		382	7.90	62	20.2	106,000	278	1,458,900	460,000		
	10	9:35 AM	952	0	8.1		397	7.93	62	23.7	121,820	332	1,706,500	460,000		
	11	11:05 AM	943	0	8.1		369	7.48	59	20.2	102,860	274	1,395,200	390,000		
	12	9:50 AM	943	0	8.1		374	8.03	64	23.6	120,170	240	1,222,100	240,000		
	13	7:05 AM	896	0	8.2		354	8.11	64	18.9	91,440	162	880,050	240,000		
Avg.			943	0	8.1		377	8.04	63	21.7	110,620	272	1,392,170	279,000		
NP-62.0	9	3:15 PM		3				13.60	116							
	12	8:00 AM		2				13.07	109							
Avg.								13.33	112							

*Omit

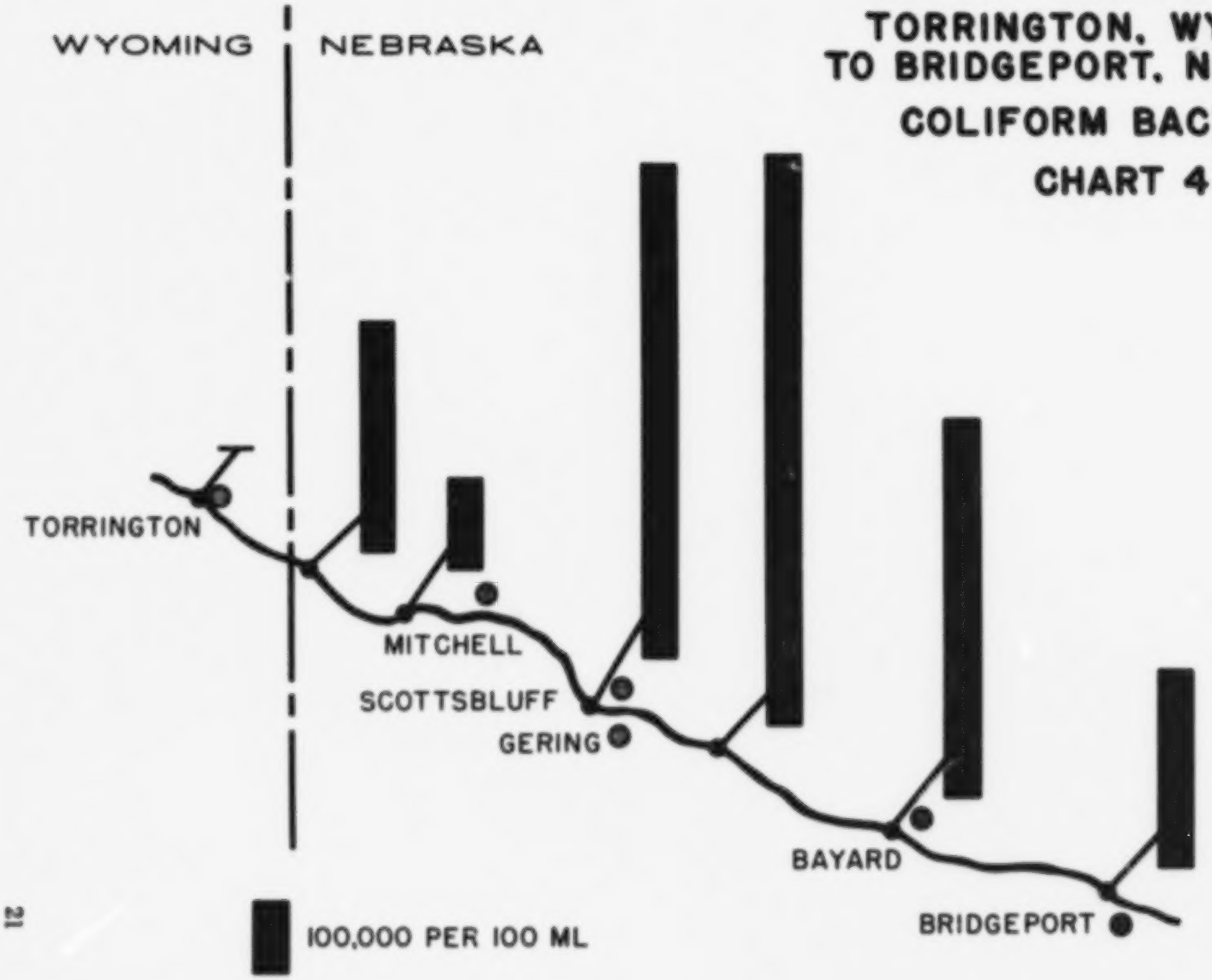


NORTH PLATTE RIVER
TORRINGTON TO BROADWATER

N
WYOMING
NEBRASKA
LEGEND
River Miles to Municipal Discharges
PHS Sampling Station Nos., 1960 Study
PHS Sampling Station Nos., 1961 Study
USGS Gaging Station
River Miles to Industrial Discharges
River Miles to Wyoming-Nebraska Boundary
INDUSTRIAL WASTE SOURCES
A Holly Sugar Refinery
B Platte Valley Poultry Dressing
C Great Western Sugar Refinery
D Co-op Creamery
E Co-op Oil Refinery
F Fisher Packing Co.
G Great Western Sugar Refinery
H H. & S. Packing Co.
I Horsch Packing Co.
J Mitchell Dairy
K Scottsbluff Rendering Co.
L Great Western Sugar Refinery
M Miller Packing Co.
N Swift & Co. Packing Plant
O Great Western Sugar Refinery
Torrington
Henry
Morrill
Mitchell
Lyman
Scottsbluff
Gering
Minatare
Bayard
Broadwater
Ft. Laramie Canal
Interstate Canal
Rawhide Creek
Bear Creek
Horse Creek
Laramie R.
Miles

20b

NORTH PLATTE RIVER
TORRINGTON, WYOMING TO BRIDGEPORT, NEBRASKA
COLIFORM BACTERIA
CHART 4



livestock and poultry packing wastes.

The coliform bacteria density commonly accepted as satisfactory for sources of domestic water supply for which adequate treatment is provided, and for general recreation, exclusive of bathing, is an average of 5,000 per 100 milliliters. For bathing, a commonly accepted limit is 1,000 per 100 milliliters. Below Torrington the coliform densities were 26 to 163 times the common objective for sources of domestic water supply and for general recreation, and 132 to 815 times the common objective for bathing. Such uses of the North Platte water, either in the river itself or in irrigation canals drawing water frpm this reach of the river, would involve hazards to health.

BIOCHEMICAL OXYGEN DEMAND

Chart 5 presents information on the average B.O.D. concentrations obtained during the December study.

The B.O.D. trend in relation to sources of wastes generally was similar to that for the coliform bacteria.

Above Torrington the B.O.D. averages 1.4 milligrams per liter, which is typical of reasonably clean water. Near the state line, the Holly Sugar Company wastes increased the average B.O.D. to 57.3 milligrams per liter Some residual of the B.O.D. from the Holly Sugar Company plant persists at all downstream stations and contributes to the B.O.D. concentrations found at those stations.

At the next station downstream, natural purification and dilution reduced the B.O.D. to 23.6 milligrams per liter, and the decrease continued to 22.2 milligrams per liter at the station just above Scottsbluff. The wastes from the Great Western Sugar Company plant at Mitchell entered the river between the latter two stations, but dilution and natural purification combined prevented an increase in B.O.D. concentration at the Scottsbluff station. When B.O.D. concentrations and stream discharge data at the two stations are used to calculate the total waste loads in pounds per day, an increase in load occurred, from 41,700 pounds of B.O.D. per day above Mitchell to 53,600 pounds per day just above Scottsbluff. The 11,900 pounds per day increase is not a full measure of the load from the Mitchell plant, since it includes no allowance for the reduction accomplished by natural purification between Mitchell and Scottsbluff.

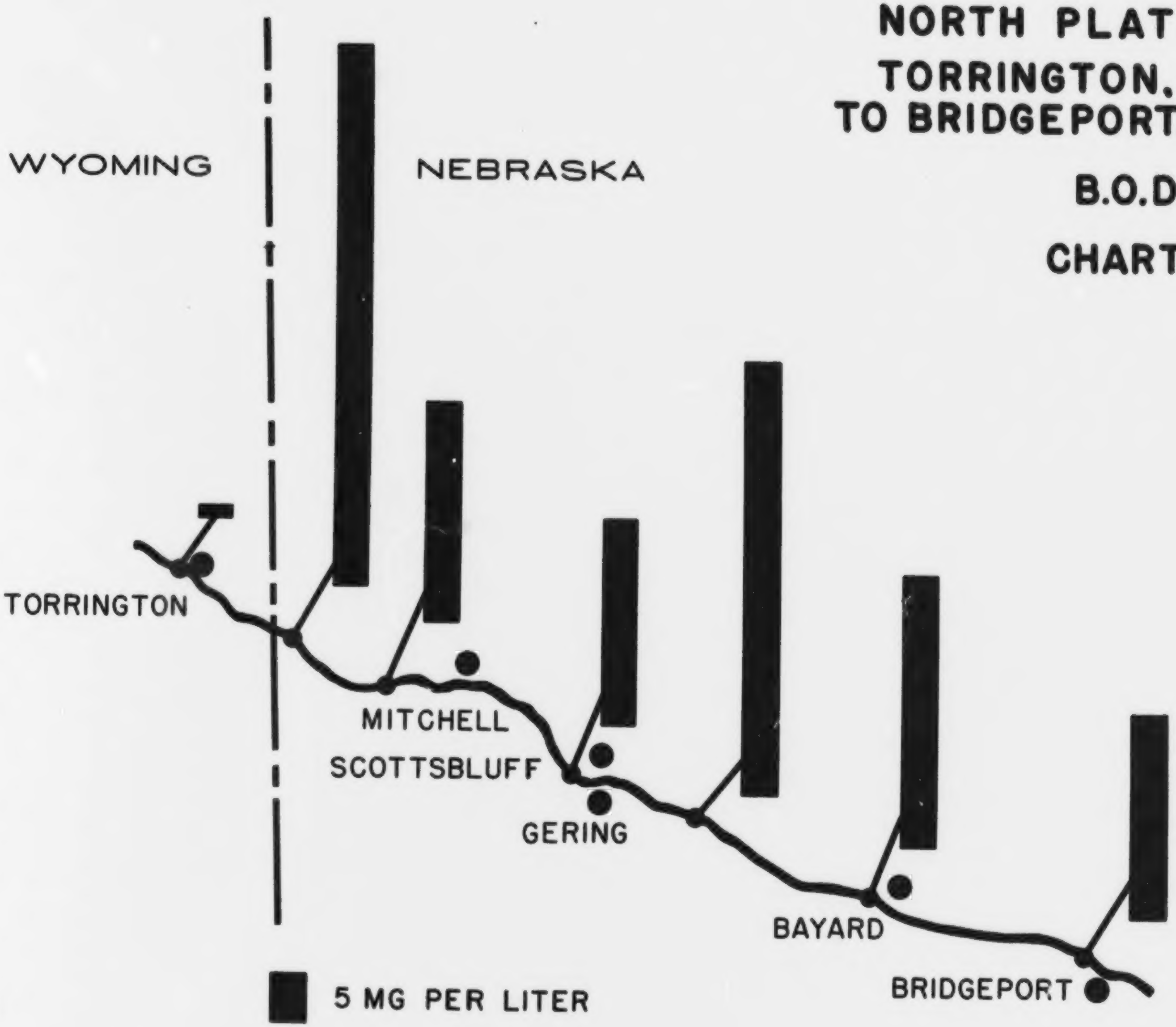
Near Minatare, below Scottsbluff, the B.O.D. concentration increased to 46.4 milligrams per liter. Although this concentration was less than 57.3 milligrams per liter below Torrington, it represented a total organic load twice as great as that below Torrington, because of the difference in stream flows. The B.O.D. load below Torrington was 86,000 pounds per day compared to 172,000 pounds per day below Scottsbluff.

Downstream from the Minatare station the B.O.D. concentration decreased to 29.3 milligrams per liter above Bayard and to 21.7 milligrams per liter at Bridgeport. Although the treated wastes from the Great Western Sugar Company plant at Bayard entered the river between these two points, both the B.O.D. concentration and the load in pounds per day were less at Bridgeport than they were above Bayard. The B.O.D. reduction by natural purification between the two points was greater than the B.O.D. added by the sugar plant

NORTH PLATTE RIVER
TORRINGTON, WYOMING TO BRIDGEPORT, NEBRASKA

B.O.D.

CHART 5



wastes.

The B.O.D. determination is a measure of the amount of dissolved oxygen (DO) that is used by organic wastes during the process of decomposition. As such, it also is indirectly a measure of the concentration of unstable organic matter which will support the growth of biological organisms.

If waste organic matter uses dissolved oxygen of a stream faster than the D.O. is replaced by absorption from the atmosphere and by photosynthesis, the normal aquatic life, including fish, of the stream may be damaged seriously or even destroyed. Determination of the relationship between the oxygen demand of organic wastes and the resulting D.O. of a stream generally is undertaken to establish the concentration of organic matter that the stream can tolerate without causing excessive depletion of the dissolved oxygen. The concentrations of organic matter that streams can tolerate without excessive dissolved oxygen depletion vary widely, depending on depths and turbulences of the individual streams. Stream pollution control authorities generally employ as a standard some minimum allowable D.O. concentration, commonly 5 milligrams per liter, which will support normal aquatic life. This single value controls the concentration of B.O.D. which may be allowed in any individual stream and which may vary widely from one stream to another. The use of the single dissolved oxygen standard is a convenient administrative tool, since it avoids the time-consuming and expensive necessity for establishing many B.O.D. standards for a wide variety of streams and even for different sections of a single stream.

While the dissolved oxygen standard is a convenient and widely used device, it has its limitations. Some streams are so shallow and turbulent, with such high reaeration capacities, that they can accept extremely high concentrations of B.O.D. without excessive oxygen depletion. In such streams the organic matter which causes the B.O.D. may be deleterious to other aspects of water quality and use, regardless of how much or how little it may deplete the D.O. of the stream.

Excessive organic pollution, as reflected by B.O.D., can cause excessive growths of undesirable aquatic plant and animal life which may compete with and crowd out the normal flora and fauna of a clean stream and diminish the usefulness of the stream just as effectively as would excessive oxygen depletion. In addition, high concentrations of organic matter may render water unsuitable both as a source of domestic water supply and for many industrial uses.

The swift, shallow reach of the North Platte under consideration has an extraordinary capacity for receiving high organic loads without suffering extreme dissolved oxygen depletion. Serious oxygen depletion was not found during the December 1960 survey, as is noted in the following section on dissolved oxygen. Nonetheless, average B.O.D. concentrations in the range of 21.7 to 57.3 milligrams per liter indicate organic pollution that renders the water unsatisfactory for many uses. In those cases where pollution control agencies have adopted B.O.D. stream standards, it generally is accepted that the oxygen demand should not exceed an average of 5 milligrams per liter on 5 day 20 degree B.O.D. in reasonably clean streams. Downstream from Torrington average B.O.D. concentrations ranged from 4.3 to 11.4 times the 5 milligrams per liter value.

DISSOLVED OXYGEN

As noted above, the average D.O. concentration did not fall below 5 milligrams per liter at any station in this reach of the North Platte. The lowest average concentrations found were 5.44 milligrams per liter below Scottsbluff near Minatare and 5.55 milligrams per liter just above Bayard. At each of these stations, one individual value of seven observations was below 5 milligrams per liter, being 4.71 milligrams per liter at Minatare and 4.21 at Bayard.

Between Torrington and Scottsbluff the lowest average D.O. found was 8.57 milligrams per liter near the state line.

The samples were collected during a period of cold weather, and stream temperatures were zero degrees centrigrade on most of the sampling days. With the same conditions of stream flow and waste discharge, but with the higher stream temperatures which occurred earlier during the sugar beet campaign, somewhat lower D.O. concentrations than those found would have resulted.

SUSPENDED SOLIDS

Chart 6 presents information on average suspended solids concentrations found during the December study.

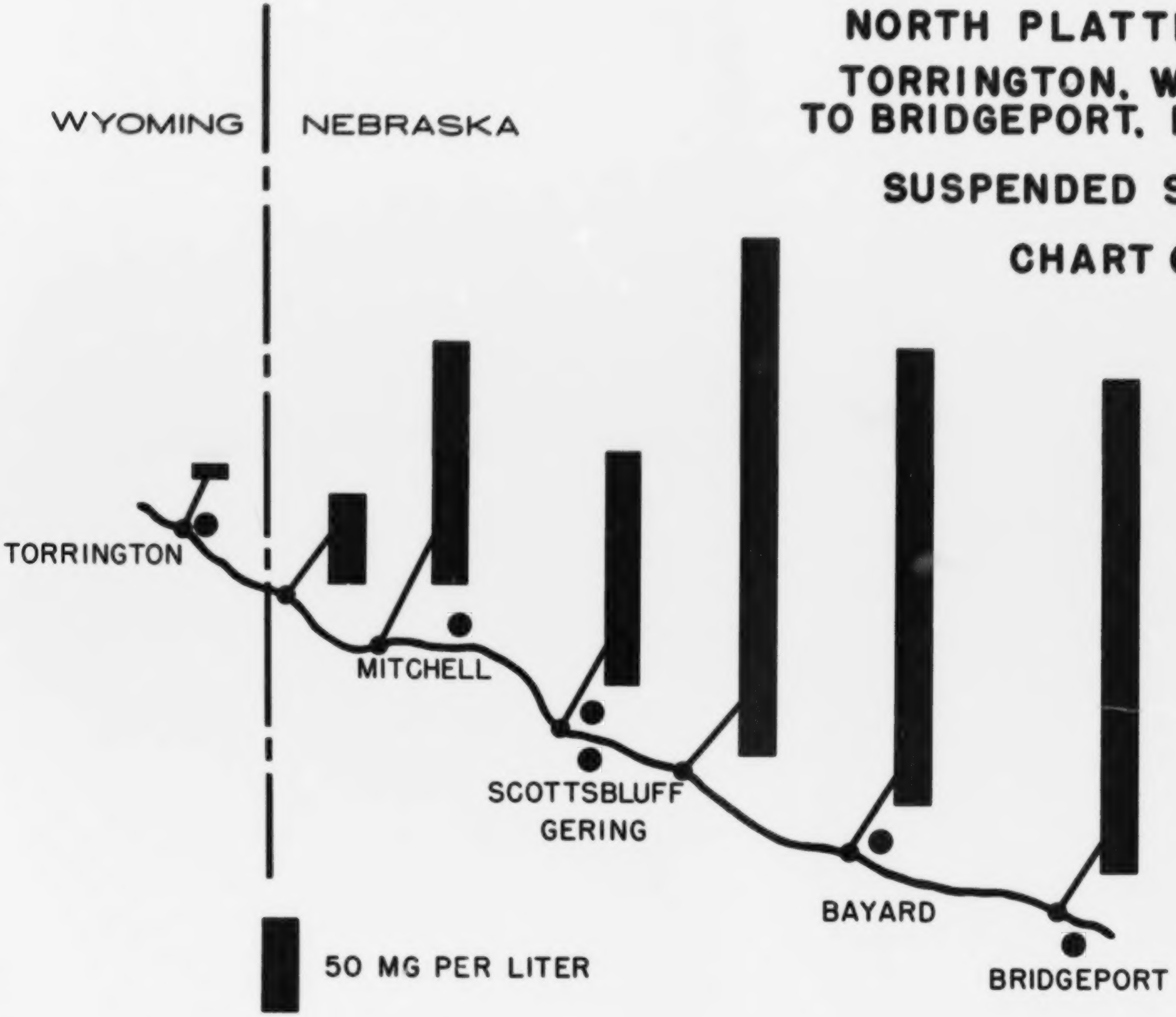
Above Torrington the clear North Platte River carried very little suspended matter, with an average concentration of 7.8 milligrams per liter.

The waste discharge from the Holly Sugar Company plant was sampled and yielded an average suspended solids concentration of 3,160 milligrams per liter. Based on a waste flow of 8.6 million gallons per day, the total weight of suspended solids discharged from the plant was 227,000 pounds, or nearly 114 tons, per day. Of this, 194,000 pounds per day, or 85.5 percent, were fixed suspended solids. Most of the fixed solids presumably were soil washed from the beets during processing.

At the next station downstream, near the state line, the suspended solids increased to 48.9 milligrams per liter, which represented a load of only 73,500 pounds per day At the second downstream station, near Morrill, the suspended solids increased to 133 milligrams per liter, representing 235,000 pounds per day. Very little wastes enter between the two stations. Since the 235,000 pounds per day checks satisfactorily with the 227,000 pounds per day measured in the Holly Sugar Company waste discharge, it must be concluded that the lower of the two stations more nearly represents the load of suspended solids imposed on the North Platte by the Holly Sugar Company wastes. Further investigation would be needed to explain the difference in results at the two stations.

There was a slight decrease in suspended solids at the station just above Scottsbluff, below the municipal sewage and sugar plant waste discharge from Mitchell. The concentration here was 128 milligrams per liter, but dilution by increased stream flow accounted for this slight reduction. The total suspended solids load was 310,000 pounds per day, for an increase below Mitchell of 75,000 pounds per day.

NORTH PLATTE RIVER
TORRINGTON, WYOMING, TO BRIDGEPORT, NEBRASKA
SUSPENDED SOLIDS
CHART 6



Below Scottsbluff sewage and industrial waste discharges the solids increased to 284 milligrams per liter, or 1,053,000 pounds per day, for an increase of 818,000 pounds per day, or more than 400 tons per day.

Just above Bayard the solids concentration decreased by dilution to 252 milligrams per liter. Below the Bayard sewage and sugar beet waste discharges the concentration increased to 272 milligrams per liter and the load increased to 1,392,000 pounds per day, for an increase of 296,000 pounds per day.

In the entire reach of the North Platte the suspended solids cause the river to appear unsightly and diminish its appeal for recreation. Some of the solids settle to the bottom of the river and smother aquatic life that normally would develop there to serve as fish food. If need should arise for use of the river as a source of municipal or industrial water supply, the suspended solids would increase the cost and difficulty of water treatment.

ALKALINITY

Alkalinity is one of the constituents of water that is increased by use for irrigation. This was the only constituent reflecting the effects of such use that was determined during the December study. Lime wastes discharged from sugar beet processing also increase alkalinity of the water.

Above Torrington the alkalinity of the North Platte was 217 milligrams per liter, which is moderately high. Below Torrington the alkalinity increased to 247 milligrams per liter, and above Mitchell it remained very nearly the same at 242 milligrams per liter. The increase in load between Torrington and Mitchell represented 103,000 pounds per day.

Below Mitchell the alkalinity increased to 290 milligrams per liter, for an increase in total load of 381,000 pounds per day.

Below Scottsbluff there was an increase to 379 milligrams per liter, representing an increased load of 700,000 pounds per day.

At Bayard the concentration decreased slightly to 371 milligrams per liter, but the load increased by 210,000 pounds per day.

Below Bayard, at Bridgeport, the concentration increased slightly to 379 milligrams per liter, and the load increased by 310,000 pounds per day.

It is not possible to separate the sources of the increase in alkalinity between Torrington and Bridgeport, which was a total of 1,594,000 pounds or 797 tons per day. The total load carried by the river at Bridgeport was about six times that above Torrington. Contributing sources were the beet sugar plants, return flows from the irrigated farms, and the natural alkalinity of normal surface runoff.

While the alkalinity as such found in the North Platte is not a serious pollutant, it is a measure of a portion of the total hardness, which can be objectionable in water used for domestic and many industrial purposes. The increase in alkalinity also is an indication that increases in several other mineral constituents probably result from use of the water for irrigation. The other minerals can interfere with re-use of the water for irrigation as well as for domestic and industrial uses. Further investigation of this aspect of pollution of the North Platte is needed to evaluate this potential problem.

VISUAL OBSERVATIONS

During early December 1960 the North Platte River above the Holly Sugar Company plant was a beautiful, clear, sparkling stream which was a pleasure to observe. Below the plant the clarity of the river gave way to a murky brown appearance, and many large particles of suspended matter were obvious. This condition persisted downstream at least to Bridgeport, with the most objectionable appearance occurring below the Scottsbluff-Gering area. Here the water was extremely dark and appeared dull and lifeless.

The sewage and industrial wastes virtually destroyed the aesthetic appeal of this reach of the North Platte.

SUMMARY AND CONCLUSIONS

Pollution of the 67-mile reach of the North Platte River from Torrington, Wyoming, to Bridgeport, Nebraska, was investigated during December 1960.

In Torrington, Wyoming, the river received beet sugar wastes from the Holly Sugar Company plant and partially treated sewage from the plant employees. Torrington sewage was being impounded in stabilization ponds and there was no overflow of sewage to the river at that time. In Nebraska the river received raw sewage from seven communities -- that should now be eight -- and partially treated sewage from two. Four beet sugar plants of the Great Western Sugar Company discharged wastes to the Nebraska reach of the North Platte. Of these, the plant at Bayard has facilities for broad field disposal of its wastes. In addition, wastes were discharged from meat, poultry, milk, vegetable, and oil processing plants. Many of the industries were concentrated in the Scottsbluff-Gering area.

The sewage discharges had an estimated bacterial contamination potential equivalent to that of the raw sewage from a population of 16,500, of which less than one percent was discharged in Wyoming.

The sewage and industrial wastes had an estimated oxygen demand equivalent to that of the raw sewage from a population of 1,360,000. The Holly Sugar Company wastes in Wyoming accounted for more than one quarter of this total. This plant, in combination with the four Great Western Sugar Company plants in Nebraska, accounted for ninety-five percent of the oxygen demand wastes discharged to this reach of the river.

The sewage and the beet sugar and meat and poultry processing wastes contributed to extremely high concentrations of coliform bacteria in the river. Near the state line the average MPN of coliform bacteria was 329,000 per 100 milliliters, and below Scottsbluff the average MPN was 815,000 per 100 milliliters. The lowest average MPN found anywhere below Torrington was 132,000 per 100 milliliters above Morrill, Nebraska. These densities were 26 to 163 times the 5,000 per 100 milliliters which is indicative of reasonably satisfactory water quality. Use of the contaminated water either in the river or in the irrigation canals for swimming, boating, fishing, or other uses which might involve ingestion of the water, would present a health hazard to the users.

The organic wastes from the Holly Sugar Company plant produced a B.O.D. of 57.3 milligrams per liter near the state line, which was the highest concentration found at any of the sampling stations. The next highest B.O.D. was 46.4 milligrams per liter below Scottsbluff, and no value below Torrington was less than 21.7 milligrams per liter. These concentrations were about four to eleven times the 5 milligrams per liter which may be considered indicative of a stream that is only moderately polluted.

Below Torrington the suspended solids were 133 milligrams per liter at Morrill, and they rose to a high of 284 milligrams per liter below Scottsbluff. The increase in suspended solids from above Torrington to Bridgeport was 1,392,000 pounds per day, or 690 tons. Of this, 227,000 pounds per day was contributed by the Holly Sugar Company plant and 743,000 pounds per day by the Scottsbluff-Gering area sewage and industrial complex. Although not revealed by the solids measurements in the flowing water, there were deposits of solids on the bed of the stream which essentially eliminated bottom life in the stream. This will be discussed more fully in the separate report on biological findings. In addition, the suspended solids virtually destroyed the beauty of the stream and would interfere seriously with treatment of the water for domestic or industrial uses.

Alkalinity of the river water increased throughout the stream reach under consideration, increasing from 217 milligrams per liter above Torrington to 377 milligrams per liter at Bridgeport. The increase was equivalent to 1,594,000 pounds per day, or 797 tons per day. A portion of the increase was caused by the lime used in sugar beet processing, and another portion by irrigation return flows. While the increase in alkalinity in itself was not serious, it reflected an increase in hardness which could be objectionable in water used for domestic and industrial purposes. The increase in alkalinity also indicated a probable increase in other minerals which commonly are added to water used for irrigation. In sufficient concentrations, such minerals can interfere with subsequent re-use of the water for irrigation.

The beauty of the river was virtually destroyed throughout the reach from below Torrington to Bridgeport. Little aesthetic enjoyment could be deriver from viewing the murky, brown water, filled with suspended matter.

The wastes from the Holly Sugar Company plant at Torrington, Wyoming, seriously damaged water quality at and below the Wyoming-Nebraska state line, and residuals from these wastes added to the levels of pollution caused by sewage and wastes discharged by municipalities and industries in Nebraska. The combined pollution from all sources severely damaged potential fishery of this reach of the North Platte River, destroyed aesthetic appeal of the stream, rendered recreational use of the water hazardous to health, and rendered the water unsuitable as a source of supply for domestic and many industrial uses.

It is evident that pollution of the North Platte River by the Holly Sugar Company constitutes pollution of interstate waters subject to abatement under the Federal Water Pollution Control Act, as such pollution endangers the health or welfare of persons in a state other than that in which the discharge contributing to such pollution orginates.

CHAIRMAN STEIN: Do you care to make any comments or have any questions?

DR. SAMPSON: Not just yet. But I would like to introduce Mr. Earl S. Burwell, who is also a member of the Wyoming Stream Pollution Control Advisory Council.

MR. BURWELL: I arrived late, but the letter said 10 o'clock, and while I was eating breakfast the newspaper said 9 o'clock.

DR. SAMPSON: Well, the papers are right once in a while.

MR. BURWELL: The letter was wrong.

DR. SAMPSON: It says in the paper also that this is being handled by the Department of Interior. (Laughter)

CHAIRMAN STEIN: That is right.

While we are introducing people, I would also like to introduce Mr. Woodrow Brunson, of the Washington office of the Department of Health, Education and Welfare, Public Health Service, not of the Department of Interior.

Are there any questions at this point from the Conferees or do you want to continue?

DR. SAMPSON: I think we should further continue.

CHAIRMAN STEIN: If not, let us proceed.

Mr. Clare.

MR. CLARE: I would like to call next on Dr. Joe K. Neel. Dr. Neel is Regional Biologist, Public Health Service, out of Kansas City. He is also Chief of our Water Quality Section. I mentioned his name in my introductory remarks. Joe has participated in all the studies on the North Platte River since these were started under our old river basin program.

At this time we would like to hear from Dr. Neel about the biological studies.

DR. NEEL: I do not have a formal typed report to hand to the members of the conference here simply because we finished part of this study just Sunday, day before yesterday, and there was hardly time to prepare a report before this time. I think we can give you the essential items that we wish to cover, and we will have a final report later on.

We recently, beginning in November 1960, and then on August 30, 1961, made studies of the biology of the North Platte River from above Torrington to Mitchell in November and from above Torrington to Bridgeport this August. In regard to the physical condition we have a series of photographs that show some of the things we found in November. I wonder if we can pass these around. I will give them each to you.

The first place we sampled is above the point of sugar beet waste entry from Torrington Sugar Beet plant, just above that, and this photograph is taken there. It shows the type of situation above the sugar factory outfall.

CHAIRMAN STEIN: Would you care to either identify that photograph--

DR. NEEL: That is Figure No. 1.

CHAIRMAN STEIN: Would you want to describe the photograph, what it shows?

DR. NEEL: All right.

This photograph shows a pool above a dam. I don't know just what function this dam served in the old days, but it is a dam just below the bridge on the highway crossing at Torrington. There is a pool above it, and you can see there are a number of rocks that the water breaks over and there is quite a bit of driftwood that is caught in that dam.

CHAIRMAN STEIN: What is the condition of the water there?

DR. NEEL: The water was very clear and in good shape at the time this photograph was taken.

CHAIRMAN STEIN: Thank you.

DR. NEEL: Figure 2 shows the beet waste from the Holly Sugar beet factory at Torrington discharging into the North Platte River. That is only a few feet downstream from where the first photograph was taken. The beet waste comes out of the outfall, which is this concrete retaining wall here, and goes down along the right bank of the North Platte River, the right or south bank of the North Platte River, and it affects half the river all the way down to the Gering-Mitchell diversion dam. This is Figure 2.

CHAIRMAN STEIN: How would you say that affects it?

DR. NEEL: The water is discolored. I will get into that a little later, if you will permit me, please.

CHAIRMAN STEIN: Fine.

DR. NEEL: This photograph was taken one mile below the point of entry--this is Figure 3--of the sugar beet wastes, and it shows that about half the river is affected by the waste, made turbid, and there are other factors that we will talk about a little later, and the left half of the stream is clear. There is a line, dotted line there, that shows the diversion between those. We didn't have a polaroid filter.

CHAIRMAN STEIN: Pardon. You interposed that dotted line?

DR. NEEL: That dotted line was put on there just to show where they were, that is right.

MR. SAMSON: Mr. Stein, may I suggest that these be identified?

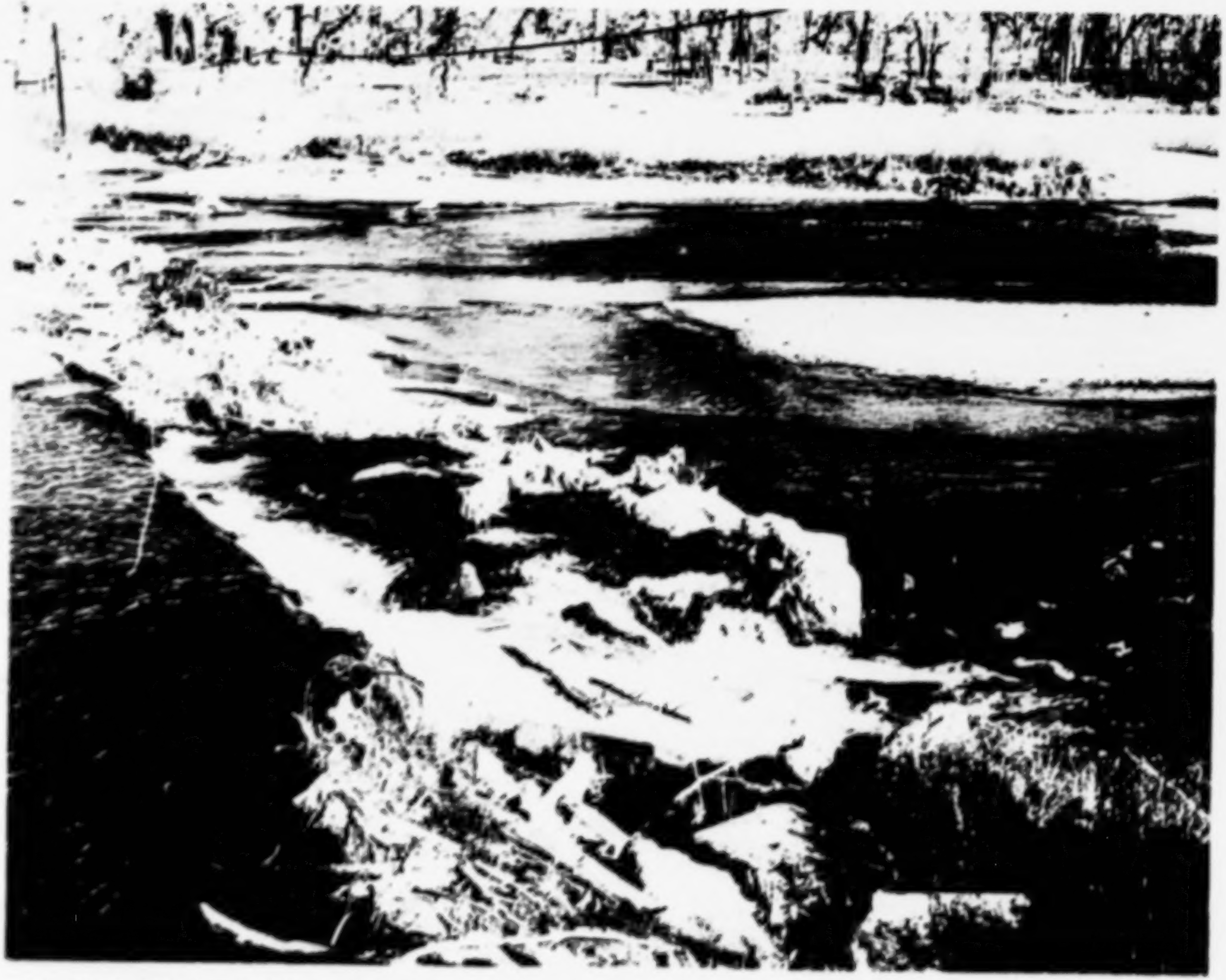


Figure 1 - Station 1, Low-head dam and driftwood in left foreground. November 16, 1960.

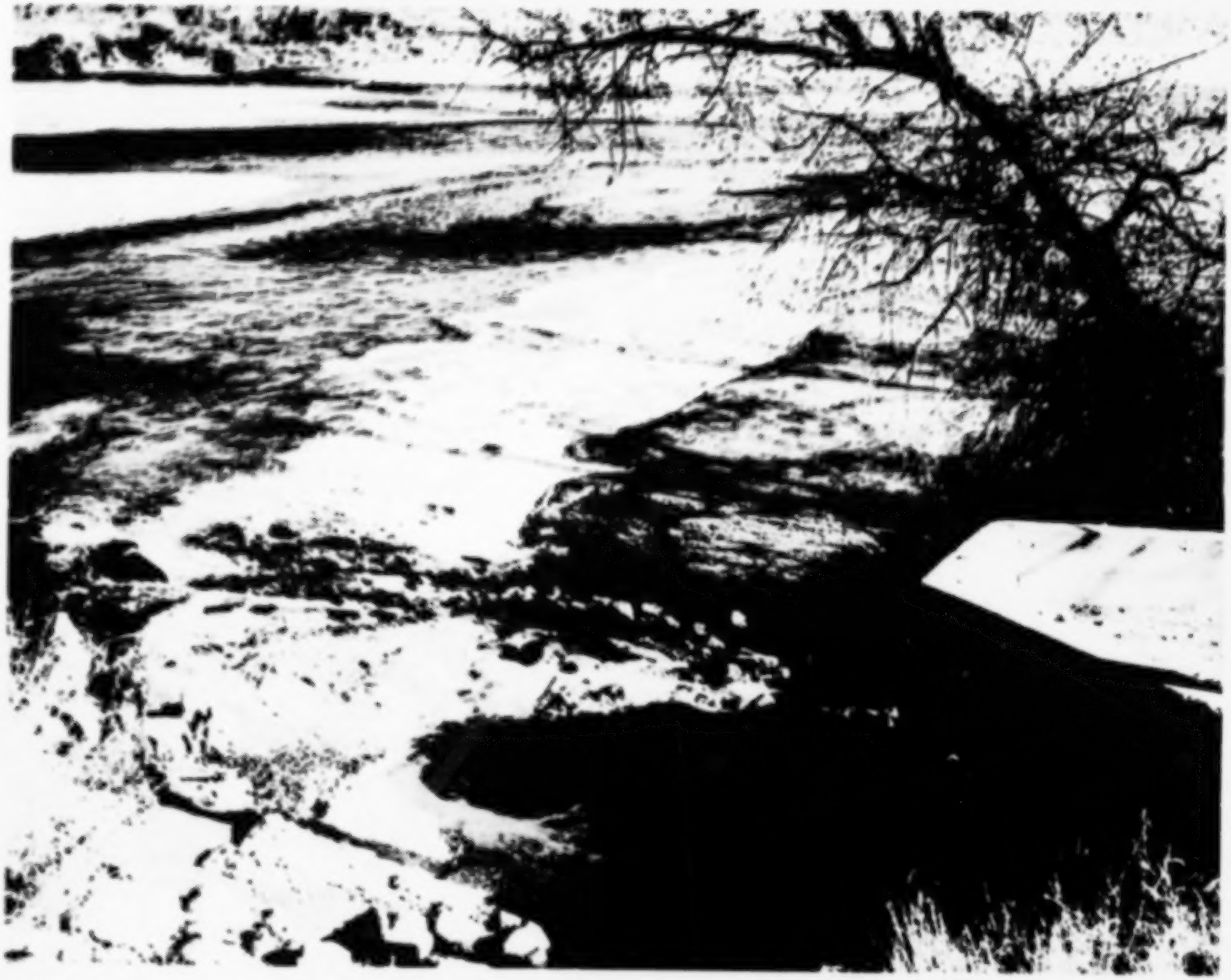


Figure 2 - Entry of sugar beet wastes into North Platte River near Torrington, Wyoming. November 16, 1960.

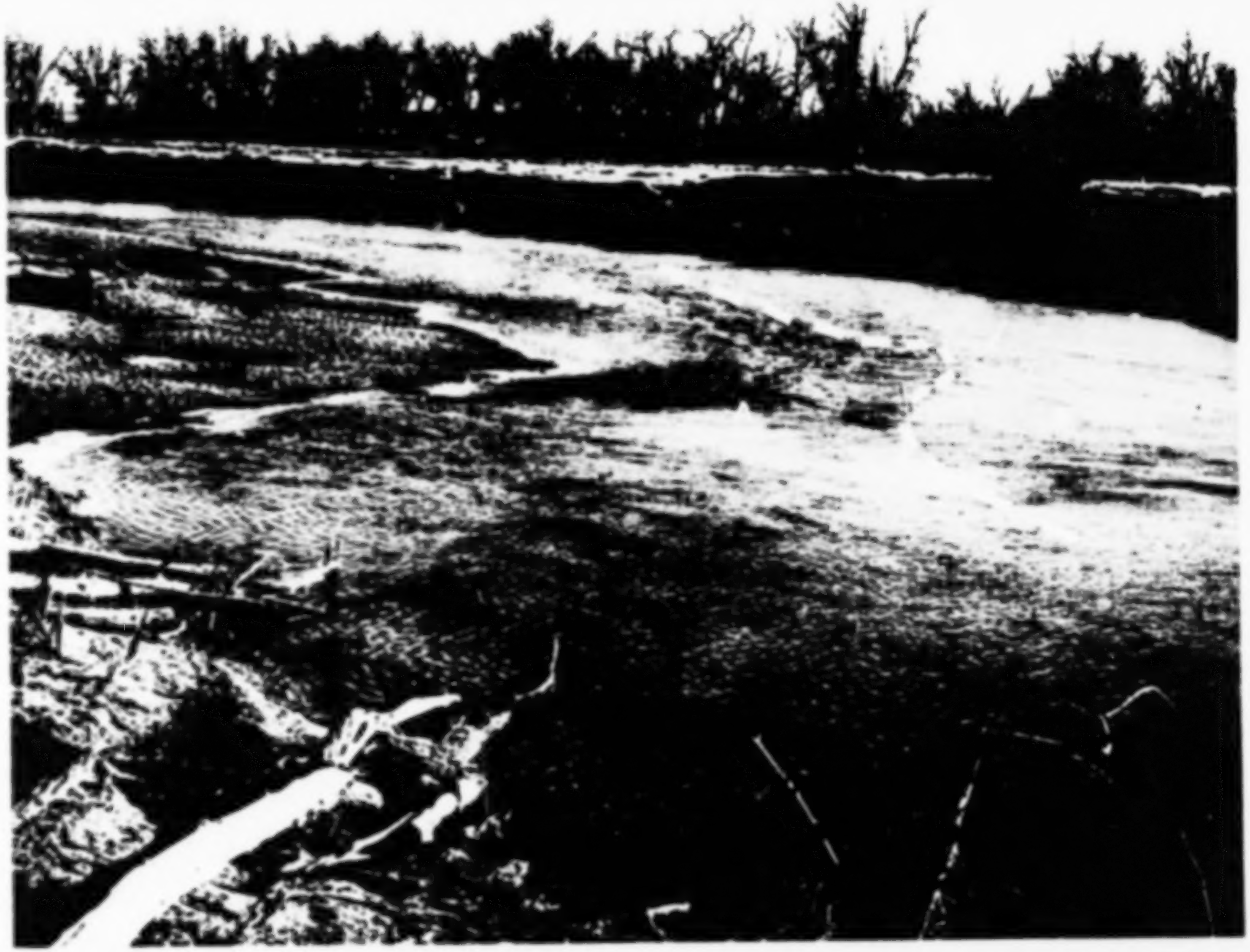


Figure 3 - Station 2, in late afternoon. "A" indicates clear water near left bank; "B" turbid water in right half of stream bed; the broken line marks the division between the two zones. November 16, 1960.

CHAIRMAN STEIN: We are identifying them by number.

DR. NEEL: That was No. 3, Figure 3.

Figure 4 shows the control structure at the Gering-Mitchell diversion dam in which all of the water in the North Platte River was taken through a narrow channel and the sugar beet wastes were mixed into the entire discharge at that point. The whole river became affected with sugar beet wastes below the control gate at the Gering-Mitchell diversion. This is Figure 4.

That is at this point right here (indicating on map) just above the state line. That canal isn't shown on this map, but just about five-tenths of a mile, half a mile above the state line is where this occurs.

This Figure 5 shows the river at Henry, Nebraska. Not much shows, but the whole thing is turbid there. That is Figure 5.

Figure 6 shows the type of material that the beet factory adds to the river. Most of this material you can see in there, beet roots, cossettes, and various things that are parts of beets, is carried along on the bed, it is part of the bed load of the river. It isn't in suspension; most of it is carried along on the bed. This sample was taken with a Pettersen dredge, which takes 0.75, three-fourths of a square foot, of bottom. This screen is twelve inches in diameter. That shows the amount of material that is placed on the stream bed by this beet factory--this was taken at Henry--and the concentration of it. This is bed load, and above this bed load there is suspended matter which gives the river a grayish-brownish color. Suspended matter consists of silt and of lime slurry which is discharged at the sugar factory.

CHAIRMAN STEIN: Dr. Neel, would you say that the contents of this dredge were typical of what you would find on the bottom of the river there?

DR. NEEL: This was typical of this area at Henry, Nebraska, yes.

Now to summarize, the discharge comes out of the factory, goes down along the right bank of the river. The bottom and the water of only the right half of the river are affected down to the Gering-Mitchell diversion dam. When the river was constricted and put through the control gate at the Gering-Mitchell diversion dam, these beet wastes were put into the entire discharge of the river and they spread over the entire river, and the entire river from that point down to Mitchell was affected by these beet wastes. The water was made turbid and bed load carried along such materials as are shown in Figure 6.

Now, the effects on the life of the river. Above Torrington, above the beet wastes, the river had a dense growth of algae over its entire width, the entire wetted width of the river. There was some pond weed at that place. Below there, one mile below, the left half of the river still had a dense algae growth attached to the stones on the bottom. The right half of the river had no algal growth at all. It was completely devoid of this bottom vegetation.

Below the Gering-Mitchell diversion dam, after the beet wastes affected the entire discharge and the entire bottom of the river, there was no vegetation all the way down to Mitchell.

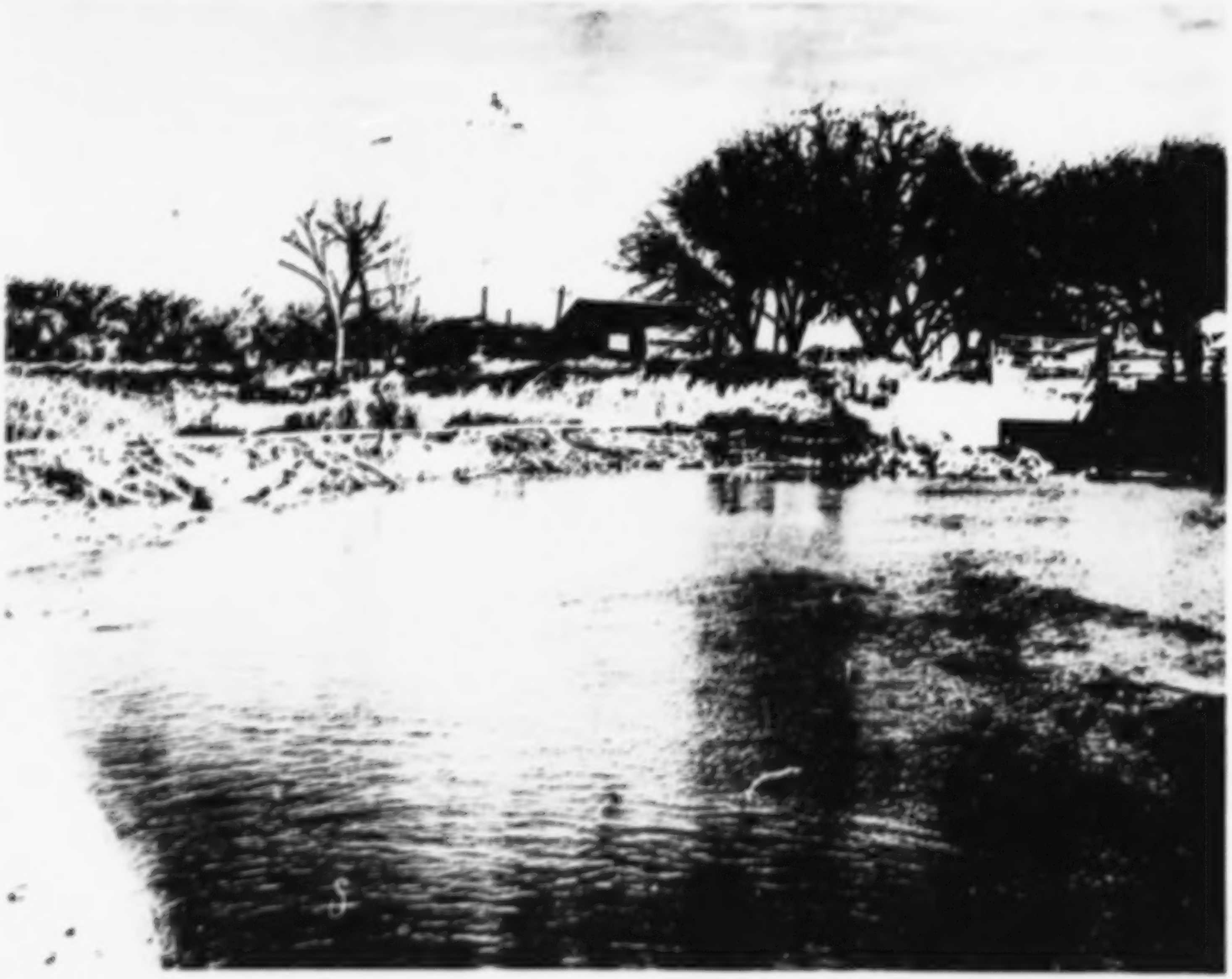


Figure 4 - Diversion dam and control channel where all discharge was mixed. November 17, 1960.

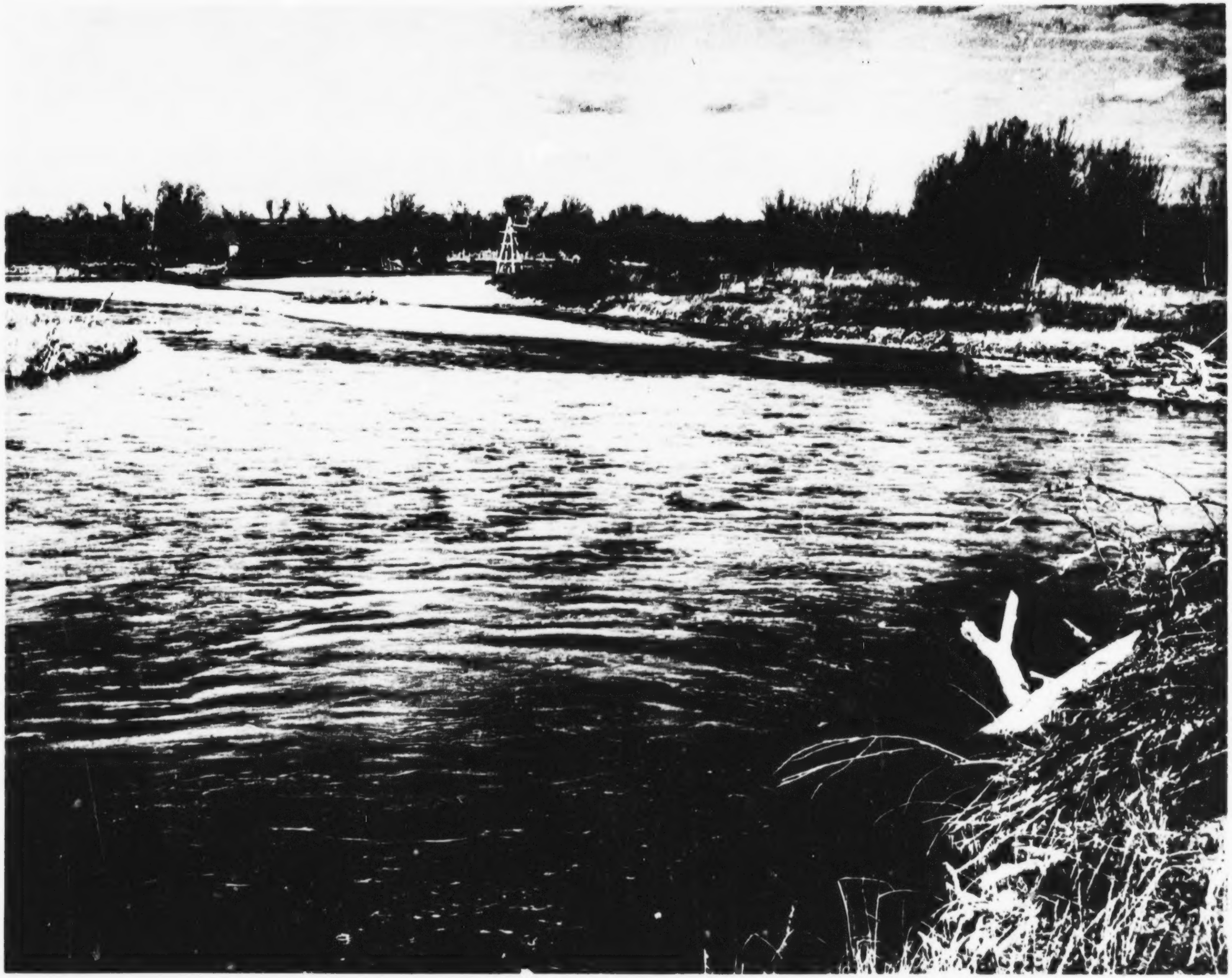


Figure 5- Station 3, south of Henry, Nebraska. November 17, 1960.

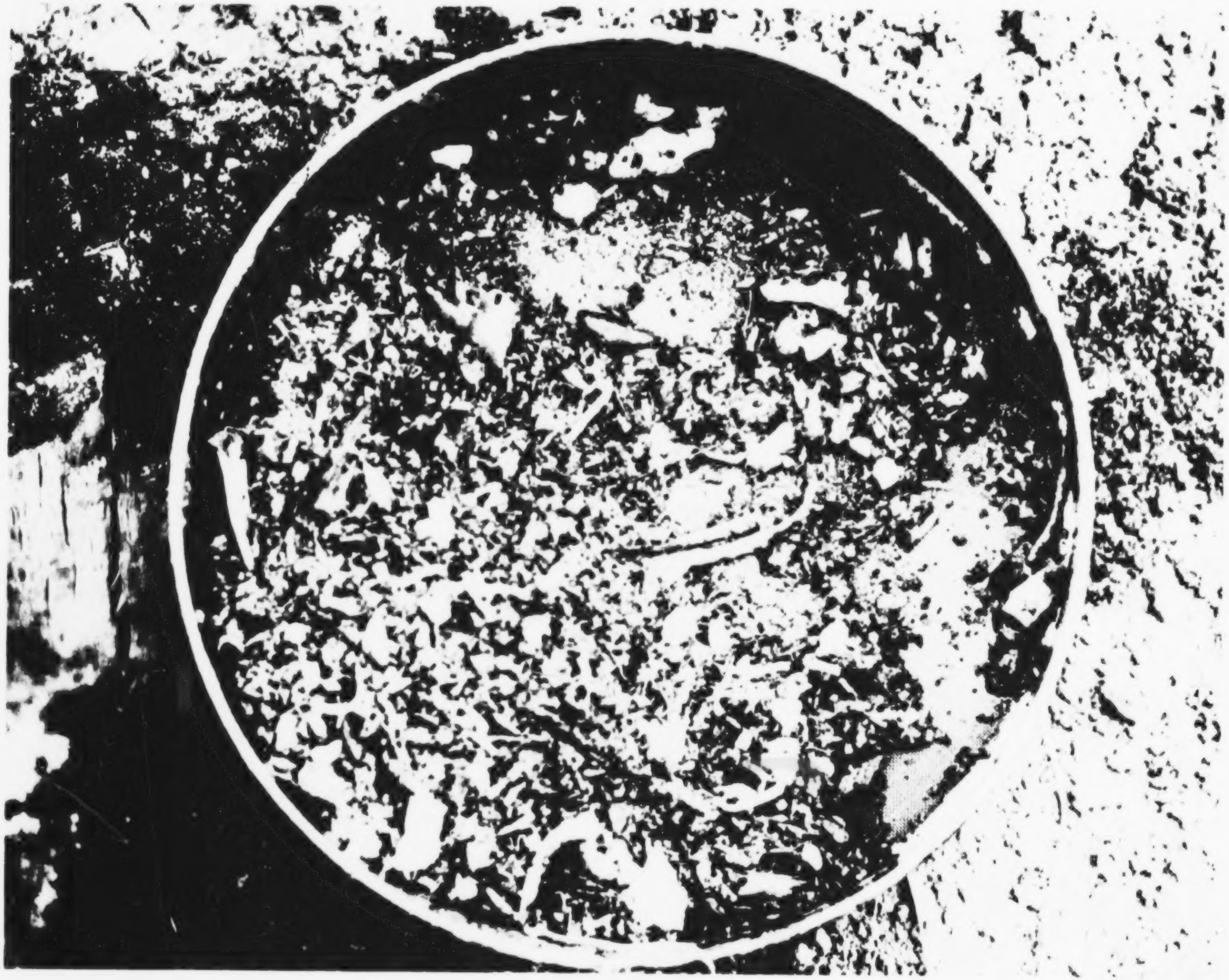


Figure 6 Beet particles, roots, tops, and pulp sieved from one Peterson dredge haul at Station 3. Sieve is 12 inches in diameter. November 17, 1961.

Algae are very important factors in streams. They furnish the basic part of food chains of various aquatic organisms. They are the grass on which the aquatic cattle feed upon which other organisms feed, and they are basic in food chains. Also by virtue of a photosynthetic process that they carry on, they greatly reduce the mineral content of the stream, chiefly hardness and alkalinity, and also increase the oxygen content, because oxygen is a byproduct of photosynthesis. So the activities of algae in this respect were restricted, were eliminated from the right half of the river down to here, (Gering-Mitchell diversion dam), and from the entire river down to Mitchell.

The organisms that chiefly feed upon the algae are the benthos or bottom organisms of the stream. There was a varied population of those above the sugar factory outfall at Torrington, and this population continued down along the left half of the river. A few of them dropped out down below there, but generally a varied population continued down to this diversion dam that we mentioned before.

On the right half of the river there were only sludge worms and midge larvae left, and sludge worms and midge larvae themselves were quite scarce. I think with twenty dredges at Henry, Nebraska, we recovered one midge and one sludge worm. Those organisms are more tolerant of silting and of organic matter than most of them, and yet there were very few of those there.

That state of affairs continued all the way down to Mitchell over the entire river. So the beet wastes eliminated algae from half the river down to this point (Gering-Mitchell dam), from all the river down to this point (Mitchell), and also eliminated the bottom fauna from half the river down to this point (Gering-Mitchell dam) and then from all the river down to Mitchell.

The other segment of the biological population that we investigated and observed was the fishes. At the point above the beet wastes, we saw brown trout and a number of suckers and minnows in fair abundance there.

CHAIRMAN STEIN: Dr. Neel, would you say that was the point above Torrington?

DR. NEEL: A point above Torrington. The brown trout were also observed about a mile below Torrington near the left bank of the river; also some minnows were found in that region. There were no fish observed under the beet wastes and no fish were observed in the river between the Gering-Mitchell dam and Mitchell.

In the summer of 1961, just a week ago--we have no photographs back to show you of conditions; we can, with the permission of the Conferees, have these available for examination later.

We began again at Torrington, but we continued the thing on down to Bridgeport. The water was quite clear at Torrington. The discharge was up considerably, about three to four hundred second feet above what we found in November of 1960. There was a very fine population of benthic organisms at that same station We went down to the point a mile below on the left and right banks, and we found a good population at that point. There were twenty-two different forms above Torrington, there were thirteen on the left bank, and twelve on the right bank one mile below.

May flies, which are a principal food of fishes, had repopulated this region, and this was true also down at the Gering-Mitchell dam. At Henry, at Mitchell, at the west Scottsbluff bridge, at the Melbeta-Minatare bridge, at Bayard, and at Bridgeport the river had been--well, we were not going to say it had been, but we found the same condition on down here that we found down to Mitchell. In other words, there had been a repopulation of the river by desirable groups of benthic organisms. Algae was growing over the entire river bed all the way down where it could find a suitable foothold to be attached to the river, and we saw fishes all the way down and they were occupying the entire river, found over the entire stream bed.

We saw trout only near Torrington and at the Gering-Mitchell diversion dam. Below there, we noted mostly migratory fishes, suckers, carp, minnows, and at one place, at Michell, we saw two green sunfish and one bullhead, which are normally not migratory fishes, but were present here.

May flies, by virtue of the long flying trips that the adults take down a river, can easily repopulate a river from which they have been eliminated or where they weren't found previously by just flying down it. Black fly larvae, which are fairly tolerant of many things but do not like much domestic sewage, had repopulated the river down to Scottsbluff. We did not find them below Scottsbluff. Caddis flies had repopulated the river down to Henry.

Where the fish came from, where they had gone last November, and where they came from to repopulate this river we do not know, frankly, because we haven't had time to study this. These are mostly migratory fishes which can swim great distances. It could be that they moved out of the river into some of these irrigation drains. We know that they definitely avoided the sugar beet wastes up in this region (Station 2) and were greatly concentrated over on the left bank there. If they did go up into the drains, well, then this population out of the river into the drains during the wintertime places an added load upon the fish carrying capacity of the drains and actually reduces the fish population or the carrying capacity for fishes in the entire stream.

The conclusion is inescapable that these sugar beet wastes are the major factor affecting the attached life, that is algae, and the benthic organisms and the fishes in this stream.

The bottom had not completely recovered. Most of the material that had been carried down as bed load the preceding fall had moved on out of this river. There were a few sludge banks. We will indicate where those are in our report on this. There were a few sludge banks at places where we saw great concentrations of these wastes in November of 1960. The bottom still contained some of the silt and beet debris that orginated in this, and some of the bottom organisms that burrow in clean sand, we will point those out in the report, were not found below here. They were not found.

The thing that permitted such a widespread repopulation of the river by these few species of organisms was driftwood that was caught in various places. Around bridges is a very good place for driftwood to be caught, and these organisms were living on the driftwood. If the driftwood had not been there and the bottom, sand and silt bottom, had been the only medium there, why, these organisms would not have occurred.

CHAIRMAN STEIN: What would you say, Dr. Neel, that these wastes had done to the fishery?

DR. NEEL: Well, the wastes have certainly reduced the fishery, almost made it of no return at all in this region. Some of the fishes that are there could be used for bait fishes, is about all that is left.

CHAIRMAN STEIN: As far as I know, the May fly always seems to be the first organism or insect to come back, generally speaking, after a pollution situation. Would you say that organisms in their full variety in the absence of any pollution here had returned?

DR. NEEL: No. No. Just the ones that were capable of living on these accumulations of driftwood.

CHAIRMAN STEIN: Well, what would you expect would happen with another beet sugar campaign?

DR. NEEL: I would expect the river to be depopulated again as it was in November of 1960.

CHAIRMAN STEIN: Generally what effect does this have on the fishery?

DR. NEEL: It reduces the fish carrying capacity of the stream considerably, because you have a period from November, probably, until the middle of the next summer when the fish population that does not feed upon algae--now, some of these fishes feed directly from algae, carp and minnows--would not have a very good livelihood.

CHAIRMAN STEIN: This has a relatively long-term effect?

DR. NEEL: Long-term effect. I would say it was an annual effect.

CHAIRMAN STEIN: Are there any other questions from the Conferees?

If not, I would suggest we recess now until a quarter to 11 and then reconvene promptly Thank you. We stand recessed for fifteen minutes.

(RECESS)

CHAIRMAN STEIN: May we reconvene? I think Dr. Sampson has another introduction.

DR. SAMPSON: Mr. Kirk, our Commissioner of Agriculture, is also a Board member. I see that Mr. Engendorff has arrived in his place. Would you please stand up and let them see who you are. Representing our State Department of Agriculture.

CHAIRMAN STEIN: Thank you, Dr. Sampson.

Mr. Clare, we will again ask if you want any discussion or are there any questions of Mr. Kittrell or Dr. Neel at this time?

MR. SAMSON: Mr. Kittrell, I would like to hand you--possibly this is an impossible assignment, but I have here before me what purports to be a resume of the Wyoming Stream Pollution Control Advisory Council meeting at Cheyenne, Wyoming, on February 25 and 26, 1958. Are you familiar with that report?

MR. KITTRELL: I have not seen the report, no.

MR. SAMSON: Maybe this is very unfair to you, Mr. Kittrell, but if you can answer the question, I would appreciate it. Possibly you will want some time to look at Articles 1 and 2 there at the top of the page, the B.O.D. and suspended solids, which apparently is some conclusion coming out of that meeting at Cheyenne in 1958.

What I would like is a correlation between that information there and the information or your testimony on suspended solids found on page 22 and also on page 23 of the Report on Pollution of Interstate Waters of the North Platte River, Wyoming-Nebraska, which you testified from. If you would like to take some time, it is perfectly all right. But could you correlate that information with the information that you have given us from your investigation as to whether or not the condition is the same from your testimony or has it improved or is it worse?

MR. KITTRELL: All right.

CHAIRMAN STEIN: I wonder if we can let Mr. Kittrell do this and ask Mr. Clare again and then call on him later?

MR. SAMSON: That is perfectly all right. Any way you want to handle it is agreeable.

CHAIRMAN STEIN: Is that all right?

Mr. Clare.

MR. CLARE: I did not indicate during my introductions this morning the several Federal agencies that are interested in water quality control in the North Platte River specifically. As a Conferee, we contacted the Federal agencies that have responsibilities and interests in this matter in this stretch of the stream.

So at this time I would like to introduce these one at a time and ask these U. S. Government representatives if they would care to make a statement before the Conferees, and, if not, if we can call on them later for comments or participation in the discussion.

We might start this off by calling on Mr. Harold E Engstrom, who is here representing the U. S. Department of Agriculture. He is with the Soil Conservation Service out of Lincoln, and he is also Chairman of the Missouri Basin Inter-Agency Committee.

Mr. Engstrom, would you care to give us a statement or some comments?

MR. ENGSTROM: Mr. Clare, I have a brief statement I would like to present to the conference.

MR. SAMSON: Do you want to read it, Mr. Engstrom?

MR. ENGSTROM: Well, it has a few statistics in it, but it will probably go a little faster if I do read it. Otherwise, I would give it off the cuff.

It is always a great source of encouragement and inspiration to soil and water conservationists to attend a conference of responsible leaders in the field of water pollution abatement and control, as this is one of the most important domestic problems affecting the health and general welfare of our people today.

Water, good water, its supply and ever-accelerating demand for multiple uses, is a matter of high priority concern to everyone in this room as well as to millions of others.

There is no point in attempting to elaborate on these general remarks to this audience. In the limited time you have for discussing the water pollution problem in the North Platte River Basin, it is my purpose to briefly express to your respective State Boards the interests of the Soil Conservation Service and also Agriculture's interests in this subject.

Although the North Platte River Basin is a relatively small interstate river basin compared with a considerable number of other interstate river basins, it has often been said that "the North Platte River is presently one of the most completely utilized and regulated water resources in the West with regard to irrigation use." There is some amount of power, of course, developed on the upper reaches of this river.

Historically, the first recorded irrigation in the basin was from the Laramie River, a tributary to the North Platte, near Fort Laramie in 1855. Today there are some twenty-two irrigation companies operating facilities for irrigating over 750,000 acres in the North Platte Valley and about 110,000 acres outside, mostly below the North Platte Basin. The irrigation of farm crops for human consumption and watering of livestock demand a supply of good water free from pollutants, including oils and inorganic wastes.

In accordance with prescribed standards of the Public Health Service, "sewage used for irrigation of forage crops should be given treatment insuring a consistent reduction of coliform bacteria of not less than ninety percent, while sewage used for irrigation of food crops for human consumption should be given treatment insuring a consistent reduction in coliform bacteria of not less than ninety-eight percent."

By the same token, water as return flow from irrigated land and also surface runoff water from farm and ranch lands into the streams should be as free from pollutants as possible, since such water must be used for many purposes downstream. Abatement of any pollution from such sources is difficult to accomplish.

Ordinarily we do not think of watershed drainage, particularly of farm lands, as a serious source of water pollution. However, silt and the erosion of certain soils heavily charged with alkali salts are a source of water pollution of lesser magnitude in the North Platte River Basin as compared with certain other western river basins. Silt adversely affects certain water uses, including fishing and recreation. The removal of silt from municipal and industrial water supply is a necessary operation, although a relatively simple one. Sediments which result from soil erosion have other adverse effects on facilities for water storage and use. For example, during the period 1945 to 1948, inclusive, the average annual cost of removing sediment from 1,600 miles of canals and laterals in the North Platte Project was $45 per mile and amounted to sixteen percent of all operation and maintenance costs.

Another significant type of sediment damage is the loss of reservoir storage capacity. For example, let us look at the Guernsey Reservoir just above the Nebraska-Wyoming state line. From a sedimentation survey conducted in the late 1940's, the following data were obtained:

The drainage area above this reservoir is 10,900 square miles; the original capacity was 73,810 acre-feet. Over a twenty-year period of record, the average annual sediment deposition in the reservoir per square mile of watershed was 0.23 acre-foot, resulting in an average annual storage loss of 1.67 percent. On the other hand, the Buffalo Bill Reservoir on the Shoshone River, the average annual storage loss over a 37-year period of record was only 0.11 percent. It appears that silt and sediment may be not only a health problem, but an economic problem as well.

One may well ask, "What can be done about this phase of the water pollution problem?" Well, it's a tremendous job, but much is being done about it, more perhaps from the standpoints of economics and food supply than from health. Methods for controlling or at least greatly reducing soil erosion have been pretty well established. Soil and water conservation is being widely adopted by farm andranch operators with assistance from established local soil conservation districts in cooperation with state and Federal agencies. This is accomplished through the use of land within its capabilities and by various conservation practices and use of water by improved farm and ranch enterprises through state and Federal soil and water conservation programs.

One of the chief concerns of the Missouri River Basin Inter-Agency Committee is the adequacy of water supply for meeting the many uses and demands of the people for clean water in the basin. In this instance, domestic needs, and to a considerable extent industrial and some irrigation needs, are presently obtained from ground-water reservoirs, particularly in the State of Nebraska.

In light of the near future demands for water, which the experts warn us as being doubled in the next two decades, we must begin now to employ every means known to conserve our water for beneficial use, and discover means to expand and increase our water supply for future needs of our expanding economy and population. Even now in most years we experience a shortage of water in scattered places throughout the basin, which is primarily a matter of maldistribution attributable to natural causes and prohibitive costs for adjustment.

Certainly much more research is in order to arrive at practical and economic solutions to the many facets involved relating to water supply and pollution control, one of the essential elements of our human welfare and existence. So let us strive by every known means and search for still better ways to protect and economically use this indispensable resource we call "water".

CHAIRMAN STEIN: Thank you, Mr. Engstrom, for a very excellent statement

Are there any comments or questions? Thank you.

Mr. Clare.

MR. CLARE: Another United States agency that is interested in water conservation and water quality is the Department of Army, Corps of Engineers. We have been advised by General William R. Shuler's office, the Division Office, that the Corps would be represented here today by Mr. Joseph Bennett out of the Omaha office, and it was indicated that he might have a brief statement or general remarks to make. Is Mr. Bennett here?

Mr. Joseph H. Bennett of the Corps of Engineers at Omaha.

MR. BENNETT: I am here from the Omaha District and, I believe, Missouri River Division, too. I think they decided to combine representation.

We don't have a formal statement, but we thought we would make a few remarks. As you know, the Corps has a continuing interest in the conservation of the nation's streams. Although some people believe that our main purpose is flood control and irrigation, the Corps of Engineers is the single Federal agency with authority to engage in comprehensive basin planning across the entire United States and its territories. There are other agencies which have the same authority, but they are limited to certain states, certain areas.

Since 1928 we have been engaged in basin planning, initially in the 308 reports and later by specific authorization, in which case Congress will authorize us to study certain river basins. In developing a comprehensive basin plan, we consider not only flood and erosion control, but all other aspects of water resources development. We bring into it where we can irrigation, municipal water, recreation, fish and wildlife conservation, power, and all other sources. And we do recognize the desirability of water quality in the streams, although from the Corps' standpoint we do not take that as a major consideration.

Currently we do not have an active or authorized investigation of the North Platte River Basin. In 1939 the Omaha District prepared a survey report and submitted it on the North Platte River and tributaries in Wyoming. This report concluded with respect to flood control that the main stem of the North Platte River had not in the past been subject to damaging floods and that the possibility of occurrence in the future was not large enough to warrant consideration of flood control measures. Presently we are conducting investigations in the lower Platte River, which goes from North Platte all the way to the mouth, and the South Platte River, which goes from the headwaters to its confluence with the North Platte.

These studies are complex and include many related water problems. We are still in the process in some cases of gathering information. We pick off little pieces of them where the flood problem particularly might be serious, and we study isolated areas to see what can be done. Completion of these two studies is scheduled for 1965 and 1966, respectively.

The Corps is happy to participate in this conference. We are not here to take any major part. We are here to learn what the problem is, what your solutions are, and what can be done. We feel that the solutions in these can be applied to our own studies and we can learn from them how to better apply them in our future work, their application into other basins, other streams, particularly in the lower Platte and the South Platte River Basin.

CHAIRMAN STEIN: Thank you, Mr. Bennett.

Are there any comments or questions?

Mr. Clare.

MR. CLARE: Of course, there has been reference frequently this morning to the Bureau of Reclamation and its interest and responsibility in water resources development. Mr. John Spencer is the Regional Director of the Bureau of Reclamation in this area, with offices in Denver. Mr. Spencer couldn't be with us today, but he has assigned his very able Assistant Director, Mr. J. L. Ogilvie, to make a statement for the conference this morning. Incidentally, Mr. Ogilvie is accompanied by Mr. R. M. Sensintaffar, Project Manager for the Bureau at Casper.

Mr. Ogilvie, please.

MR. OGILVIE: Mr. Chairman and Mr. Clare, I have a brief statement that I would like to make. I appreciate very much the opportunity of participating in this meeting.

Gentlemen and friends. I am very pleased to be here today at Scottsbluff as the representative to this conference of Region VII of the Bureau of Reclamation. Part of our Region's responsibilities is the direction of reclamation activities in the North Platte River Basin. We are deeply conscious of the problem of pollution in this stream.

Likewise the Bureau of Reclamation has always been interested in the development of good quality water for its irrigation projects. The streams from which our irrigators obtain their water must be kept clean, and we are glad to note the accentuated interest today of city, state, and Federal Government groups toward this worthwhile end.

The Bureau of Reclamation has long been active in the elimination of wasteful uses of water and in the development of new sources of supply.

The reduction of nonbeneficial consumptive use of water has taken the form of lining canals, something that the irrigation districts of the North Platte are doing something about now, reduction in reservoir evaporation, elimination of phreatophytes and the nonexcessive use of water in the production of crops. Maintaining weed-free canals is a step in the right direction, and North Platte water users, in cooperation with universities, Federal and state agencies, and commercial suppliers of weed-control additives, are learning how to do the job. These factors all affect the supply that becomes available for other, particularly domestic, use.

In the development of new sources of supply, the various agencies of the Department of Interior, such as our Bureau of Reclamation and the Geological Survey, have been gaging streams, researching ground water, building dams with sizable reservoirs, and, of course, the Department is now busy investigating and developing ways and means of converting sea and brackish water to fresh water at a price low enough to be within the reach of many users.

After construction of Glendo Reservoir, transporting water downstream during the winter months became a reality, and the problem of fluctuations in the river below Alcova Reservoir was thoroughly considered. The problems of fish and wildlife, pollution abatement and river fluctuations were of concern to everyone.

A Technical Subcommittee representing the Wyoming Natural Resources Board, the State Engineer's Board, the State Game and Fish Commission, the U. S. Fish and Wildlife Service, the U. S. Public Health Service, the U. S. Bureau of Reclamation, and the City of Casper worked out the best program of river operation.

This Technical Subcommittee concluded that the available minimum of 330 cubic feet per second was acceptable for river operation from the standpoint of fish and wildlife. Completion of Gray Reef Regulatory Reservoir this year will enable us to regulate the North Platte River flows below Alcova Reservoir to enhance pollution abatement, fish and wildlife habitat, recreation, and additionally permits the full capacity of the Alcova power plant to be utilized.

The pollution problem in the Casper area was particularly bad because three refineries at Casper had been dumping oil refuse into the river. In addition, the City of Casper, a town of some 40,000 people, was running untreated sewage into the river.

As a result of an over-all plan, the refineries agreed to no longer discharge water or oil refuse into the North Platte River. They now pump the waste water into evaporating ponds. Collectively they pump roughly 23,000,000 gallons of water and oil per day into the ponds. This is approximately seven acre-feet per day.

In thinking of stream pollution, the Bureau of Reclamation recognizes that it is not solely a problem of municipal sewage and industrial plant waste. Irrigation returns may contain pesticides, agricultural chemicals, insecticides, or just plain salts dissolved from the soils.

To treat this type of waste in an effective fashion presents many problems. Some of it returns to the ground water and then moves laterally and feeds into the streams by effluent seepage.

At present there is no practical way of collecting and treating return flows from irrigation use preparatory to repeated use farther downstream.

But there are some solutions in a different direction that can be made.

The time is not too far distant when the communities of the North Platte River Valley, in order to assure themselves of an ample and pure water supply, will join together in the formation of a municipal water supply organization.

Such an organization will pioneer in the North Platte Valley by planning and constructing a giant water aqueduct to transport clear, cool mountain water from reservoirs on the headwaters of your streams. Seminoe, Pathfinder, Alcova and Glendo are there now and could supply all of the towns down the valley, possibly as far as North Platte. This aqueduct system could include adjacent communities of Cheyenne and Alliance.

Such a closed aqueduct system, with modern treatment facilities by the communities, would be a major step in meeting the pollution problem, but only insofar as a municipal water supply is concerned.

The groups represented in this conference today are keenly aware of North Platte River pollution problems. But in order to do an effective job, the people of the area must be made equally aware of the problem's existence. One of the constructive things that could emerge from this conference would be a program of information to our citizens, so that they, in turn, having full knowledge, might give the moral and financial backing so necessary to the success of a program of this magnitude and importance.

Interstate water compacts, in the past, have contented themselves with statements as to quantities of water to be delivered at state lines or certain other points of measurement. If we are to face the problem of stream pollution forthrightly in future compact negotiations, the time has arrived when negotiations should consider the quality as well as the volume of water in our streams.

Once we have an effective understanding of our pollution problems by all interests along a stream, such as the North Platte River, and that understanding is made effective by binding agreements, much of the problem of pollution will have been solved.

Thank you, sir.

CHAIRMAN STEIN: Thank you very much, Mr. Ogilvie.

Are there any questions or comments?

Mr. Clare.

MR. CLARE: Before we go on, I think we ought to ask Mr. Sensintaffar to stand so everyone will know who you are and get you acquainted a little more easily.

MR. SAMSON: I think Mr. Long has a comment that he desires to make there.

MR. LONG: I am Frank Long, President of the Wyoming Stream Pollution Control Advisory Council.

The gentleman that just spoke didn't give the Wyoming Pollution Council any credit for clearing up the North Platte River. Seven years ago we were told we couldn't do it.

CHAIRMAN STEIN: Mr. Clare.

MR. OGILVIE: Mr. Clare, I am sorry if I have overlooked someone that was, I know, on the Technical Committee and they participated to a great degree and were instrumental in achieving some of the things that I mentioned. I am sorry.

MR. CLARE: Another Department of Interior group which is interested in water quality is the U. S. Geological Survey, and Mr. S. K. Jackson, Division Hydrologist in the Denver office of the Geological Survey, has advised us that Mr. Don M. Culbertson, District Engineer with the Survey Water Quality Branch, Lincoln, will be with us today and give us a statement.

Mr. Culbertson.

MR. CULBERTSON: Thank you, Mr. Clare.

Conferees, I would like to express Mr. Jackson's regrets at being unable to attend your conference here. We in the Survey do have a deep interest in the pollution problems throughout not only this basin but all basins.

The interests of the Survey in the water resources of the North Platte River basin are those concerned with the quantity, quality, and distribution of the available water supplies and the solution of water problems to aid in the conservation and sound management of the water resources. Of special interest are the source and amount of natural and manmade pollution and the effect of the pollution on the suitability of the water for use.

The Geological Survey participates in the conservation and sound management of water resources by inventorying existing water supplies, by observing and recording the effects of natural and manmade developments affecting these supplies, by proposing solutions to existing water supply problems, and by calling attention to potential problems and suggesting possible methods of averting them. Although other agencies, public and private, are responsible for the construction of water use facilities, the Survey supplies to those agencies many of the water facts needed for the planning of such developments.

Having no regulatory powers, the Survey has no control over the allocation of water rights, nor can it enforce legislation pertaining to the use or pollution of water supplies. Instead, it furnishes to the law enforcement agencies many of the water facts needed for good judgment in exercising their prerogatives. The Geological Survey also conducts research into the occurrence, availability, behavior, and chemical characteristics of water.

Most of the water resources investigations made by the Geological Survey are financed through cooperative agreements with state, county, or municipal governments or with other Federal agencies. The results of the investigations are made available to the public in basic data or formal publications which can be consulted in libraries throughout the country and are available at nominal cost from the Geological Survey Area Centers and from the Superintendent of Documents, Washington, D. C.

In cooperation with the States of Nebraska and Wyoming and with the Bureau of Reclamation, and other Interior agencies, the Geological Survey has collected considerable information on the water supplies in the North Platte River drainage basin. Aerial studies of the occurrence and chemical quality of ground water have been made in Albany, Carbon, Goshen, Laramie, and Platte Counties, Wyoming, and in Banner, Morrill, and Scotts Bluff Counties, Nebraska. Also, records for many years are available on the flow of the North Platte River and its principal tributaries. At the present time, streamflow records are being obtained at about ninety gaging stations in the basin. Only limited studies on the chemical quality of surface water and sedimentation have been made. Some data are available at about nineteen sites in the basin.

Probably the most significant record is that for the North Platte River below Guernsey Reservoir, Wyoming. It is the longest record and provides a good indication of the chemical quality of water that actually moves interstate. During the 1951 water year, the records for the North Platte River at Guernsey, near Goose Egg and near Cassa, include determinations of ammonia, nitrite, nitrate, organic nitrogen, soluble phosphorus, and total phosphorus. From 1951 to 1953 records for the North Platte below Casper include determinations of phenolic compounds. A small amount of data on radioactivity of surface and ground water supplies has been obtained since 1958 at selected sites. Sediment records include the concentration and discharge of suspended sediment and some information on the particle size distribution of suspended sediment and bed material.

We share with the Conferees here today the interest in the water problems in the North Platte River basin, and the Survey stands ready to assist through cooperative programs with state, county, municipal, or Federal agencies in the study of possible solutions to the present and potential water problems.

Thank you.

CHAIRMAN STEIN: Thank you.

Are there any questions or comments?

Thank you.

MR. CLARE: We were advised through Mr. Robert W. Burwell's office, Regional Director of the U. S. Bureau of Sport Fisheries and Wildlife Service, that that Service would be represented here today by Mr. Ivan A. Peterson, Jr., Area Supervisor, Missouri River Basin Studies. It was indicated that he might not have a formal statement to make, but that he would be prepared to discuss in a general way this Bureau's responsibilities and interests.

Is Mr. Peterson here?

MR. PETERSON: Mr. Chairman, ladies and gentlemen. I have no formal statement, as has already been stated here.

I think our interest in this particular problem here is obvious.

We are authorized to investigate and report on any instances of water pollution where they affect fish and wildlife resources as needed.

That is all I have.

CHAIRMAN STEIN: Thank you.

MR. CLARE: Thank you. We may call on you later during some of the discussions, if pertinent.

MR. PETERSON: All right.

MR. CLARE: The Bureau of Mines has indicated that Mr. Albert S. Konselman will be its representative here today.

Would you care to make a statement, Mr. Konselman, for the U. S. Bureau of Mines?

MR. KONSELMAN: Mr. Clare and gentlemen.

We have no formal statement to make either. However, the Bureau of Mines, at least the region that I represent, Region III, comprises eight states: North Dakota, South Dakota, Nebraska, Wyoming, Utah, Colorado, Arizona, and New Mexico. And while we have not done any work on water pollution directly, we are making a survey of the water needs of the mining industry and the mineral industry and probably at the moment are more interested in the amount of water that they need and what they do with it rather than its quality after they get through with it.

However, I am very glad that we were included in this meeting, and I hope you will continue to count us in, because we certainly are sympathetic with anything that has to do with the abatement of stream pollution.

Thank you, sir.

CHAIRMAN STEIN: Just a moment, Mr. Konselman.

Are there any questions or comments?

MR. SAMSON: Mr. Konselman, may I ask this question: Do you have any problem in your region with abandoned mines filling with water and the water seeping into waterways or--

MR. KONSELMAN: I don't know of any. Now, they do, I know, in coal mines, but as far as our region is concerned, if we do have any problem, it hasn't been brought to our attention. I don't think that there is such a problem, no.

MR. SAMSON: Thank you very much.

MR. KONSELMAN: That is my best understanding. I have been in the mining business a long time, and I can't remember a metal mine where the effluent--there is some acid water comes out, but it is very small. That is generally in these sulfide mines, copper mines, and if it carries any copper, why, they are right on the job to--

MR. SAMSON: Seal them off?

MR. KONSELMAN: Well, no, they don't seal it off. They let it come out, because they want to get the copper out of it. But they use that water over and over again. I don't think it is a problem.

MR. SAMSON: Thank you.

CHAIRMAN STEIN: Mr. Clare.

MR. CLARE: The Bureau of Land Management is represented here today by Mr. Eugene L. Schmidt. He is the Lands and Mineral Officer out of the Cheyenne office of the Bureau.

Mr. Schmidt, do you have something you want to give the group?

MR. SCHMIDT: Thank you, Mr. Clare. I have no prepared statement.

Like Mr. Bennett, I am here to learn something from the experts, so my remarks will be very brief.

The Bureau of Land Management administers about one and four-tenths million acres which are tributary to the North Platte River. Our administration is through a district office in Casper and a state director's office in Cheyenne. Almost all of that one and four-tenths million acres is under grazing lease through the provisions of the Taylor Grazing Act. Most of those leases are issued for ten-year periods.

We are both technicians and administrators. As administrators, we handle these grazing leases of which I spoke. If there is any contribution to pollution of the North Platte River, I should think it would be from solid materials eroded into the river from these grazing lands. In that respect, there is a soil and moisture conservation program by which we practice soil stabilization through re-seeding, through water spreaders, through water retention dams, and so forth.

I believe that is all I have to say.

CHAIRMAN STEIN: Thank you, Mr. Schmidt.

Are there any comments or questions?

Thank you.

MR. CLARE: Thank you, Mr. Schmidt.

Before I left the office I had not yet heard from the National Park Service. I wonder if there is anyone here from the National Park Service representing Mr. Howard W. Baker, the Regional Director.

I guess they did not see fit to appear.

I believe that concludes the Federal agency participants.

CHAIRMAN STEIN: Mr. Kittrell, are you ready now with the answer to

Mr. Samson's question?

MR. KITTRELL: I would like to have the question stated and I will see if I have the answer.

MR. SAMSON: Do I trust myself with that record in front of me?

CHAIRMAN STEIN: Do you want to get off the record first?

MR. SAMSON: No. My question merely is this, Mr. Kittrell.

What, if any, change has there been in the conditions prevailing as your investigation revealed in 1960 and 1961 as compared with the remarks on that memorandum that you have in your hand there referring to certain facts as they existed back in 1958 involving the Holly Sugar plant at Torrington, Wyoming? Is there any difference? And if there is, what constitutes the difference?

MR. KITTRELL: I may have to call on Art Williamson to help me answer this. I think he will know more of the background on this than I may.

But the statement that you called to my attention is that a plant of the type and size of the Torrington Holly Sugar Company plant which does not practice waste control or treatment is estimated to discharge wastes with the following characteristics: B.O.D. 40.6 pounds per ton of beets processed or 121,800 pounds of B.O.D. per day. Suspended solids 115.4 pounds per ton of beets processed or 346,120 pounds per day.

As I understand this, this is what would be expected from the plant based on -- I presume this is based on Hayse Black's Industrial Wastes Guide for the Beet Sugar Industry, Art?

MR. WILLIAMSON: Yes.

MR. KITTRELL: These are the quantities of B.O.D. and suspended solids that you would expect from a plant that practiced no waste control of any sort; in other words, just dumped everything into the stream.

The statement says further that it is estimated that correction measures have reduced the B.O.D. from the 40.6 tons without control to 19.96 pounds of B.O.D. per ton of beets.

We estimated from our stream studies, not from measurement of the plant waste itself, but from the B.O.D. of the stream, that the plant was discharging about 20 pounds per ton of beets, which is very close to this estimate, during the 1960 study. On suspended solids, however, our data--

MR. SAMSON: Just a minute, Mr. Kittrell. Then there was no change at all in the situation out at Torrington as it involved this sugar plant from 1958 up until the time you made your study in 1960 and 1961, is that right?

MR. KITTRELL: Well, I would have to ask Art. Is this 19.96 pounds of B.O.D. per ton figure for 1957 or 1958?

MR. WILLIAMSON: That was based upon the improvements made in handling wastes in the plant and then applying it to Hayse Black's figures by reduction.

MR. KITTRELL: But that was as of what date?

MR. WILLIAMSON: As of 1958, I think.

MR. KITTRELL: As of 1958.

MR. WILLIAMSON: There was a stream pollution survey made in 1957, late fall of 1957, and this was written up in the spring of 1958 for our meeting.

MR. KITTRELL: I would say that since this figure of 19.96, which was estimated for 1958, is essentially the same as our 20 pounds per ton for 1960, that there has been essentially no reduction in B.O.D. in the interim.

On suspended solids, however, our figures do not agree with the estimated values given for 1958. The estimated value was 21.39 pounds per ton of beets processed for a total of 64,000 from the entire plant per day. Our data, and in this case we did measure suspended solids in the plant discharge, give us 75.7 pounds of suspended solids per ton of beets instead of the estimated 21.39 pounds, or about three times as much as was estimated for 1958. And incidentally, the second station downstream below in the river itself, downstream below the Holly plant discharge, checked this value quite closely, that is our value of 75.7 pounds per ton of beets.

MR. SAMSON: That answers my question, Mr. Kittrell. Thank you very much.

CHAIRMAN STEIN: Are there any further questions or comments?

MR. LONG: The second station of where?

MR. KITTRELL: It was just south of Morrill, I believe.

MR. LONG: It wasn't right at Henry?

MR. KITTRELL: No. The Henry values did not check, as I pointed out in my report, for some reason. We don't know why at the present. We would have to investigate further to find out. But at the second station downstream we got 235,000 pounds per day compared to 227,000 pounds per day measured in the sewer from the plant itself.

MR. SAMSON: In line with Mr. Long's question, then, was there anything in between Morrill and Torrington that contributed to that condition?

MR. KITTRELL: Nothing that I am aware of, unless by some chance there could be a large irrigation return flow there carrying a lot of silt, and I am not sufficiently familiar with the area to say whether that is a possibility there or not.

MR. SAMSON: Do you know if there is, Art?

MR. WILLIAMSON: I am not familiar enough with the area to know whether there is anything in there. As I understand, though, generally they are not too large drainage areas down there; they are smaller irrigation drainages that come in.

MR. CLARE: I wonder if Mr. Sensintaffar could help us on this. Are you familiar with this?

MR. SENSINTAFFAR: I don't think I know in any case of the number of drains that dump into the river from Torrington down to Morrill, but most of those drains are pretty clear. It is something that I am unaware of, and I am not--I believe that either Mr. Murphy or Mr. Klietsch here, from the State of Wyoming and the State of Nebraska, could answer that question better than I can.

CHAIRMAN STEIN: Do you want to comment?

MR. WILLIAMSON: Cliff, can you give some information on the thing?

MR. BOSLEY: I am Clifford Bosley with the Game and Fish Department.

Art, I am not too sure, but I believe just before we made that survey in 1957, approximately a month before that, we had a conference with some of the Holly officials, and as a result of this they promised that they would do some work on their traveling screen and I believe there was some improvement made just prior to our study that year. So that may account for the reduced load.

MR. WILLIAMSON: But I was thinking in answer to Kitt's question here on this last survey, he can't balance his solids between those two stations there. In other words, they are low at state line and then pick up a little further down. Do you know of any big drainage or anything coming in there that would affect the solids concentration in that area?

MR. BOSLEY: No, I don't. I was just thinking of the reduction at the plant site.

CHAIRMAN STEIN: Are there any further questions or comments?

MR. SENSINTAFFAR: Mr. Clare, I might want to add something. We have samples of all the drains and a number of chemical analyses of them, and we could certainly supply that information, but it is just not at my tongue's tip right now. This gentleman over here refers to Horse Creek. I was referring to drains a while ago. He said that Horse Creek is a source of some sediment now.

Why don't you elaborate on that?

MR. CLARE: Would you give us your name, please?

MR.WIBERG: Mr.. Oscar Wiberg; County Health Office.

The only stream that I can think of between that first sampling point and the second one would be Horse Creek that comes from Wyoming, goes past Lyman, Lyman sewage, and there isn't too much of elevated land. It goes through a lot of pastures until it gets into the North Platte River.

That is about all I know about it.

MR. CLARE: I would like to make a remark. I don't believe, Mr. Sensintaffar, that you and Mr. Ogilvie were here this morning for Mr. Kittrell's presentation when he indicated that we need more information on the quality of irrigation return flows. So this information you have, I think we would like very much to have to include in our file and records.

MR. SENSINTAFFAR: Might I ask, what do you need besides chemical analysis and parts per million of dry substance? What is the nature of the chemical analysis that you need?

MR. CLARE: Mr. Kittrell.

MR. KITTRELL: Well, we would like a fairly complete mineral analysis, including sulfates, chlorides, calcium, sodium, possibly magnesium, if you have it, and also we would need stream flows to make the data meaningful.

CHAIRMAN STEIN: Thank you.

As I understand this, one of these 1958 reports that you gave Mr. Kittrell was based on an estimate and Mr. Kittrell's figures were based on a stream survey. As I also understand it, there was a pretty close correlation between the material coming out ofthe mill and the second station. Now, the likelihood of any other source just putting in that precise amount of wastes to meet that correlation may be remoted, but these are things that I think we have to consider. It may be a defect in the sampling technique at the first line, I don't know, or something of that sort.

If there is nothing further, we might call on the State of Wyoming. Dr. Sampson.

DR. SAMPSON: Mr. Stein.

A year ago, approximately, we joined the Nebraska Water Pollution Control Council in this room in a joint meeting in which we discussed our mutual problems. I didn't realize at that time that a year later we would be called back by the Nebraska Council to account further for ourselves. This is unkind, inasmuch as I am a University of Nebraska graduate and went to school with Dr. Rogers. And the other thing about it that disturbs me is that we are being complained about eight miles of river and we have a lot of it upstream that we would like to say something about, because, as Mr. Long indicated a few minutes ago, much has been done with the Wyoming's portion of the North Platte River.

In our state we recognize water to be what it is, probably our most vital commodity, which is essential both to life and to industry. Its multiple uses are just beyond belief and almost beyond imagination, and it must be controlled both from a standpoint of health and from a standpoint of usability.

Wyoming is very proud of the fact that the past ten years, and largely through the use of Public Law 85-660--I think it is 85, isn't it, or 84; the one in which we obtained matching funds on developing sewage systems--that we have made more progress, I think, proportionately than any other state in the Union, with the possible exception of North Dakota, that we now have some ninety-five percent-plus of our people on properly-sewered systems, and that our water is becoming more and more controlled bacteriologically. We recognize that we must do more work in the field of controlling water purity from conditions other than bacteria, which raises a question which we would like to ask eventually about whether or not the coliform organisms referred to in Mr. Kittrell's report were the Escherichia coli, or E. coli, or whether they were coli aerogenes, which are the soil and the other type of coliform bacteria which would be a factor to consider.

In 1951 the State of Wyoming had become aware, as we must always become aware of things through probable contamination , of the fact that something had to be done with our state's waters, and the Wyoming Stream Pollution Control Advisory Council was formulated. The State Health Officer, I believe, for many years has been the State Pollution Control Officer. I know that this has been true since at least 1947, and perhaps this was true even before that. But our State Department of Public Health was reorganized and new laws were written in that year, and that is the reason I used that date. The then Governor Simpson of our state was very much concerned about our water, and our Stream Pollution Council was given instructions to meet with communities, with industry, and with people who were interested in the field of water and establish a program for the control of water.

In 1955 a fixed program was established and it is being carried on. Our Stream Pollution Control Advisory Council, of which Mr. Frank Long is the Chairman, meets four times a year. Fortunately for us, in May of this year we met and at that time the problems pertaining to the pollution of the North Platte River at Torrington by the Holly Sugar Company were discussed and Mr. Williamson will in a little bit make a more complete statement on this matter than I am making.

I do feel that water, like many of our other natural resources, has not been a problem until just the past several years. By "several" I may say twenty-five. It has been something of a problem in the larger industrial and the more heavily-populated areas of the east. In our part of the world, a state where water is discharged to all four reaches of the compass, we have major streams leaving our state and we are the headwater state of the nation. Being the upstream person, we are always the one to whom the finger can be pointed most quickly, and perhaps rightfully.

I was talking to Mr. Samson about the fact that sometimes the pot calls the kettle black, and we both agree that this is not nearly as important as that something must be done to clear the problem and that the point for doing so is some place. And so the fact that we have been called for accounting is perfectly agreeable with us, because we feel we can make a good accounting of what Wyoming has done with the water that we discharge from our state to other people.

One of my pet peeves, and I mentioned it last year, is that one of the major brewers of this country talks about pure rocky mountain water, and I would like to advise that it is purely rocky mountain water and not necessarily pure. (Laughter)

We have additional problems which are not necessarily true in the Platte drainage system, but I will tell you. It was mentioned by one of the gentlemen earlier, the Shoshone River, the north fork of the Shoshone. In

1960, according to figures supplied by the United States Forest Service, over 800,000 people visited that canyon and over 60,000 of those people used the camping facilities. We are a state that has a population of 330,000 in the wintertime and somewhere over 3,000,000 in the summertime. It is fortunate for us that nature gives us eight or nine months to recover from the visitors who come to our state. (Laughter)

I do feel that the problems that we are presented with today are not unique to the Platte Valley. The other Samson and myself both feel strongly that one of the other problems is the problem of detergents. I saw one of the--I think that is Crow Creek. Doesn't that come down here? It goes into the South Platte. Two weeks ago I was at the Wyoming Hereford Ranch and I saw this beautiful foaming stream and everybody was bragging about it. I asked Mr. Lazier what this was, because it just didn't quite look natural. It looked like bubbles and it was, and he said that is detergent. So on the way back to Cheyenne, I stopped at one of the first outfalls and there were heaps of foam of detergent. Now, we know that detergent is like salt, that it is not easily removed, particularly the hard detergent, and we know also that it is a wetting agent and that it penetrates and it adds other hazards.

We are here to assist the State of Nebraska insofar as possible in viewing this problem and working cooperatively with them. We are hopeful that the waters that leave our state can be as pure as it is possible for humans to make them. I do not feel that this is a problem that will ever be solved and be something we can walk away from. I think it is going to be a continuing problem, just like sanitation in restaurants is a continuing problem, and I think that the chief difficulty is that the more you improve your water, the more you improve your sewage, the more easy it becomes for the people who are elected to spend our money to feel that we have no problems that need to be solved. If they think the water is pure, they don't see any reason for giving you money to keep it that way. This may not be true in Nebraska, but it sure as the devil is true in Wyoming.

I think, Mr. Stein, that this will cover my general remarks. We are willing to answer questions. Mr. Williamson, who is an engineer and who is in charge of our Division of Environmental Sanitation, is the qualified person to speak on this subject in our state, though I perhaps carry the responsibility of signing my name to some of the papers.

CHAIRMAN STEIN: Thank you, Dr. Sampson.

Are there any comments or questions at this point?

If not, will you call on whoever you wish.

DR. SAMPSON: All right, Arthur.

MR. WILLIAMSON: I will give a resume of what has been done, particularly into this situation as it affects the Lower Platte.

I might say to start with that the whole North Platte watershed in Wyoming is pretty well cleaned up, in our estimation. All of our municipalities tributary to the North Platte have adequate sewage treatment at this time. All the industries, I believe, with maybe the exception of the one in question here at Torrington, have adequate disposal at this time. We again must say we feel proud of this accomplishment because the old 1948 report said the North Platte was so polluted we could never recover it, and we now have a pretty good fish stream clear down through Glendo and even below Glendo. I have never fished that, but I understand there are fish on down through Guernsey and the lower part of it. But particularly the about 75 miles from Glendo to Casper has turned into a real good trout stream since that was cleaned up.

Now, taking the immediate area of which we are talking here, the Lower Platte, immediately above the Holly Sugar we have four communities. We have only referred to one of them, Torrington, but there is also Guernsey, Fort Laramie, and Lingle. All of these communities in the last five years have constructed sewage treatment facilities of the lagoon or waste stabilization pond type, all of which will give at least eighty percent treatment to their wastes.

The only industries located in this stretch of the river are two small meat packing plants at Torrington, Wyoming, and the Holly Sugar Company at Torrington. Both meat packing plants are connected to the city sewerage, and by virtue of this fact the city would seem to be responsible for the final treatment of the wastes, reserving such requirements for pretreatment of the wastes as the city may consider reasonable and necessary. I don't know the situation right now of those packing plant wastes, but about a year ago they created so much trouble in the oxidation pond that they were being bypassed into the river. I haven't checked to see whether it was still being done during the survey or not. They are very, very small, but the blood which they introduced into the sewers blacked out the pond for a short time, so they diverted them from the treatment plant, and I don't know whether they ever put them back in or not. That is one thing we would have to check.

The major source of pollution up to this time, of course, between Torrington and Henry has been the Holly Sugar Company. This plant processes approximately 3,000 tons of sugar beets during the season, running from mid October until the end of the year. We have had a progressive program with the Holly Company. I grant you, we have had our differences at times. We have argued once in a while, but we have usually ended up at a workable solution, everybody in agreement as to what should be done at a specific time. So we have made continuous improvements at this plant since approximately 1954, and I can outline what these improvements are or what has been done.

The first installation was the retention of lime wastes in 1954. Lime ponds were constructed and they have since that time contained all waste lime and associated organic impurities which you have with the lime slurries. They constructed additional lime ponds in 1958 and 1961. This is the type of thing they have to keep adding every few years as one fills up or as they become overloaded.

In 1956 the Steffens waste water was retained and held in ponds that were constructed at that time. All Steffens wastes are retained and either evaporated or percolate down into the ground soil, may eventually reach back to the river, but we have never been able to show that this was so, that it was causing any particular degradation of the water.

In 1956 the company installed coarse Link Belt traveling screens in the main sewer as it leaves the factory. The idea of this is to take out beet chips, tails, tops, and things that were carried in the flume water. That has been operating since that time.

I might mention at this time, we will mention it a little later, too, that a fine screen is being installed in this flume water or line at this time which will retain all particles greater than .185 inch in diameter. This is to be completed prior to the 1961 or this fall campaign.

In 1955 the company installed a pulp silo return line that returned such drainage through the main separator. At the silo the water is separated by passing the pulp and water under a screen of 0.040 inch in diameter openings. The return pulp is drained and the drainage returned to the main separator and mixed with the greater flow from the separator, after which it is again restrained and goes to the sewer. I mean this is a complicated pipe diagram, but if you have never seen it, why, or know what a plant looks like, you will have a little trouble following it.

Pulp water return screenings. Two Link Belt fourteen-mesh vibrating screens were installed in 1960 to further screen the waste prior to its discharge. The screened water goes to the main sewer and the pulp returns to the silo.

The second screening operation to be completed prior to the 1961 season will screen the waste waters of the whole main sewer. Again this is another pulp screen, if you want to call it that, handling only a part of the factory wastes.

In 1960 the company installed a septic tank to take the sanitary waste, and I believe the septic tank discharge then goes to the main sewer.

Trash and dirt screen dry disposal system. Now, prior to our 1961 season here, the trash and dirt from the belts were normally flushed into the flume water. This was carried off, then, you might say, hydraulically. In this coming season it is anticipated that the dry material will be handled separately and trucked out and disposed of on the ground. These belts shake off an awful lot of the dirt and other loose material, and if we keep this out of the flume water, then certainly we will be reducing the turbidity and the silt load of this stream to a very large extent.

Then, as I mentioned before, on the final main sewer as of 1961, two 4 by 7 revolving drum screens, U. S. Standard 40-mesh, with a capacity of forty percent over the required 7,000 gallons per minute, are being installed to screen the final effluent water. Screenings will be disposed of on dry land.

It is felt that the additional screening facilities and dry handling methods discussed above and to be installed since the Public Health Service study in the fall of 1960 will remarkably change the characteristics of the waste. The Department of Public Health and the Wyoming Stream Pollution Control Advisory Council both feel that Holly Sugar Company is showing satisfactory progress in removing objectionable substance from the waste discharged to the stream.

Now, the organic strength of the waste is not sufficiently great to be of particular concern, you might say, to us in this stretch of water. In other words, we are only receiving in the range of one to two parts per million depletion in Wyoming. What it is doing in Nebraska, we can't say, but I mean it is not hurting our stream in this portion of the state. So this is a question, you might say, that will be up for discussion, as well as the other type of things.

We have primarily aimed our efforts at getting out the solids, if you want to call it this, the beet chips, tops, pulps, tails, and this type of material, plus as much silt as we could, realizing that if we could clear the stream up, it would probably be a pretty good stream through this portion of the state, because there is adequate dissolved oxygen, and even though a high B.O.D., it is not affecting us on the thing.

Those have been the actual efforts. We are, of course, looking forward to this year's operation to see how good our guess is on it. At the meeting in May we came to the agreement or the understanding that it looked at that time as though the dry handling of the wastes and the fine screens would probably put this stream in a condition we would be satisfied with. We held restrictions that we didn't know how the Public Health Service and how Nebraska wanted it, but we felt this might be our answer to this thing. Certainly it was still dependent upon evaluation after operation.

So we feel that progress is being made. The company has spent in excess of $180,000 on various improvements, so it has been, in our minds, a pretty good attempt to clean up the river.

I think as far as the actual discussion of this situation, that probably would cover it. I imagine there will be questions that they will want us to answer or expand further upon.

I was wondering if you wanted a statement from some of the other people here?

CHAIRMAN STEIN: It depends upon what you want to do. Depending on how many people you want to call on, we may want to adjourn for lunch. This may be advisable.

Let's see if anyone has any comment or questions.

MR. CLARE: Excuse me. Art, I am not sure I got the figure you gave for the capacity of the plant. The campaign lasts from October 13th to December 31st?

MR. WILLIAMSON: Roughly that period.

MR. CLARE: And processes how many tons per day?

MR. WILLIAMSON: About 3,000 tons a day.

DR. SAMPSON: Is that correct?

MR. WILLIAMSON: Mr. Croghan, you could probably give us that. Is that approximately correct?

MR. CROGHAN: About 3,000 tons a day.

DR. SAMPSON: What is your season there, ninety days or seventy-five?

MR. CROGHAN: This year we expect to harvest, oh, around about 350,000 tons for the season, and it will be about 110 days.

CHAIRMAN STEIN: Mr. Williamson, the first point, you may want a representative from Holly Sugar to answer rather than you. You mentioned the screenings, but you didn't say when they will be in operation.

MR. WILLIAMSON: They are supposed to be in operation this fall season.

CHAIRMAN STEIN: This season to meet this campaign?

DR. SAMPSON: To meet this campaign.

CHAIRMAN STEIN: The other point I can't reconcile--and, again, I think we have a pretty clear statement and we are all agreed on a factual statement, anyway, of what the situation is--I listened' to Dr. Neel's statement where he talked about the algae being wiped out and the fish avoiding half the stream, and then when it got pretty close to the Nebraska line it spread out and then Nebraska had a complete wipe-out from there on in. I don't know, you said you are satisfied with the condition in Wyoming?

MR. WILLIAMSON: We will be if the reduction which we anticipate on this fall's improvements occur.

CHAIRMAN STEIN. But you are certainly not satisfied now with the condition that Dr. Neel described?

MR. WILLIAMSON: Not when theirs was made.

CHAIRMAN STEIN: All right.

I think we are moving ahead rather well in coming to an agreement on the facts as we all see them.

MR. SAMSON: Excuse me, Murray.

CHAIRMAN STEIN: Go ahead.

MR. SAMSON: Art, this $100,000 that you are talking about there, has that been spent? Had that been expended?

MR. WILLIAMSON: Since roughly 1954, yes.

MR. SAMSON: Oh, since 1954?

MR. WILLIAMSON: Yes. These various improvements which I read off, this is roughly a total figure.

MR. SAMSON: That is seven years?

MR. WILLIAMSON: Yes.

MR. SAMSON: About $15,000 a year?

MR. WILLIAMSON: Yes.

DR. SAMPSON: Right.

MR. SAMSON: I have nothing further right now. I mean, we may after a while.

DR. SAMPSON: Mr. Stein, with your permission I would just as soon we adjourn for lunch. I would like then to talk to my Wyoming representatives outside the door, and then if they have something that they feel strongly about, we can discuss it at that time.

CHAIRMAN STEIN: All right.

We will stand adjourned until half past one.

(NOON RECESS)

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AFTERNOON SESSION, TUESDAY, SEPTEMBER 12, 1961

CHAIRMAN STEIN: May we reconvene, please.

Mr. Samson, do you have another introduction?

MR. SAMSON: I would like to introduce to you now the gentleman whose name I mentioned this morning who was called away because of his work, and that is the City Manager, Mr. Leikvold. He advises me that if any of you gentlemen receive tickets out there on the thoroughfare, if you take the ticket into the City Clerk's office right there at the counter, that they will be properly taken care of.

MR. LEIKVOLD: We will be glad to do it for you. Just right up there at the counter.

MR. SAMSON: Thank you.

CHAIRMAN STEIN: I believe, Mr. Kittrell, you were out of the room when Dr. Sampson raised the question about the nature of the coliforms that you discovered. Do you care to comment on that or give us your views on it?

MR. KITTRELL: Well, these formerly were known as E. coli. They have changed methods slightly and changed nomenclature, and so at present they are known as the group of coliform organisms run by standard methods of water analysis procedures. They are not broken down in any way. They are a group of coliform organisms.

DR. SAMPSON: Thank you.

CHAIRMAN STEIN: Does that satisfy that, or do you want to explore that further?

DR. SAMPSON: No. This satisfies us. In other words, this is a generic group? These are not identified as pathogens or into the relative groups? This is an all-inclusive group?

MR. KITTRELL: That is right.

DR. SAMPSON: Thank you.

MR. WILLIAMSON: I might just make the further suggestion that if we do further studies as a result of this, that we do make some identification as to origin.

CHAIRMAN STEIN: I think that is so. I think again--Mr. Kittrell may have some further views on that--just to put your views out as to the notion of how to deal with these when we are dealing with an unknown and what effect an organic waste such as sugar beet waste might have on the growth of fecal coliforms.

I think largely what we are interested in, and I may be going over some grounds for some of you who are familiar with it, but maybe someone isn't, that the coliform organism is an organism sometimes associated with the intestinal tract of warm blooded animals, and when it is associated with sewage that is an indication of sewage pollution. The question here is whether there is a sufficient association for that to be associated with sewage and be an adequate--a real indicator or an active indicator of sewage pollution.

MR. KITTRELL: Well, when we are certain that the coliforms can be associated with sewage, we do consider them a very definite indication of probable pathogenic organism hazard. In this case, of course, we do have raw sewage and some partially treated sewage going into the stream, along with a rather high concentration, that is for a stream, high concentration of organic matter, much of which probably is sugar.

In this case, it appears that this medium of water containing sugar would be a very good medium for considerable multiplication of the sewage bacteria, and although we cannot say with certainty, I feel that it is reasonable to assume that if the coliform bacteria from the sewage multiply because of the sugar, that any pathogens in the sewage also might be expected to multiply in a somewhat similar way as the coliforms do.

CHAIRMAN STEIN: Thank you.

Do you want anything further?

DR. SAMPSON: No.

CHAIRMAN STEIN: Do you have any other people to call on?

DR. SAMPSON: I would like to name the list of individuals that I am going to call upon. They may and they may not wish to make a statement, but in order to let them be warned; Mr. Croghan of the Holly Sugar Company, of Torrington, Mr. Frank Long, Mr. Christensen, Mr. Burwell, Mr. Engendorff, Mr. Beeley, and Mr. W. A. Gibson, who just came into the room, from Torrington, I thought that if you knew that you are going to be the next people called upon it might give you a chance to take a deep breath and be ready to say something.

With that much warning, would you like to say anything, Mr. Croghan, from the Holly Sugar Company, about this, since your company is the one that seems to be most questioned?

MR. CORGHAN: Well, Mr. Browning, our District Superintendent, was supposed to be here. Unfortunately, we had a fire up at Hardin and he wasn't able to attend. I am just attending here more or less as an observer.

I think that Mr. Williamson and Dr. Sampson have given a good factual statement of what we have done and what we are attempting to do, and I am sure that I can say that we will continue to cooperate in every way we can to help this cause along.

CHAIRMAN STEIN: Thank you.

Are there any questions?

MR. WILLIAMSON: There is one question here that you might help in clarifying.

What is your completion date for the things which you are working on now? I know you told us earlier in the summer that you were all ready to go andyou were waiting on steel at this time. What is the situation of installation?

MR. CROGHAN: Well, the dry dirt disposal is done and our sewer screens are still waiting on steel, but it is supposed to be shipped this week and it is prefabricated. We can throw it together and we will be rolling by the time the fall campaign begins.

DR. SAMPSON. Good.

MR. SAMSON: I had a few questions I wanted to ask you. Where are you located? You personally, are you at Torrington?

MR. GROGHAN: Yes.

MR. SAMSON: You are the superintendent there?

MR. CROGHAN: That is right.

MR. SAMSON: Are you familiar with the legislative background of the problems that came before the legislature, the Wyoming legislature, in December of last year?

DR. SAMPSON: January.

MR. SAMSON: In January?

MR. CROGHAN: Yes.

MR. SAMSON: What was the nature of that legislation?

MR. CROGHAN: Well, as far as I understand it, it was--

MR. SAMSON: I realize that your problem is that the general superintendent is over at this place where the fire is. That is more unfortunate, and I can sympathize with you on the position that you are in.

MR. CROGHAN: Yes.

MR. SAMSON: I mean coming down here and expecting somebody else to probably carry the load. Don't be abashed if you can't answer, but I am interested in some things.

MR. CROGHAN: Well, the program we are attempting to carry out of screening--

MR. SAMSON: No, my point was the legislative matter that was before the Wyoming legislature last January. What was the nature of that?

MR. CROGHAN: Well, it was a bill introduced to eliminate agricultural processing for the matter of elimination of silt from the river; kind of gave us preference over some other industry, perhaps, in that respect. Agricultural industry, I think, was stipulated in the bill.

MR. SAMSON: Now, that would have specifically exempted the Holly Sugar Company or all companies situated as Holly would be from the program of pollution control?

DR. SAMPSON: No.

MR. CROGHAN: I don't think so.

DR. SAMPSON: May I break in this?

MR. SAMSON: Sure.

DR. SAMPSON: I think I can answer that question. A bill was proposed and presented, which never came out of committee.

Did it get out of committee?

MR. LONG: Yes.

DR. SAMPSON: It did get out of committee. This bill would have exempted agricultural processing of any type from being considered as a stream pollutant and would have been removed from the jurisdiction of the State Health Officer. This bill got out of committee and didn't pass the House, but never came out in the Senate.

MR. LONG: It was voted in the Senate and lost.

DR. SAMPSON: It was voted in the Senate and lost eight to eighteen. It lost in the Senate, but didn't come out in the House.

MR. LONG: No.

DR. SAMPSON: It was a Senate bill.

MR. LONG: That was a companion bill.

MR. CROGHAN: Didn't this concern silt?

DR. SAMPSON: Removal of silt, but it didn't define silt.

MR. SAMSON: Then that would have exempted the industry from the control of the Stream Pollution Control Advisory Council of Wyoming?

MR. CROGHAN: Had it passed, I presume it would, yes.

MR. SAMSON: The Stream Pollution Control Advisory Council of Wyoming would have had no jurisdiction on such operations as yours at Torrington?

MR. CROGHAN: I think that is right.

MR. SAMSON: All right. Now, after that was defeated, then did somebody go and talk to the Governor about the problem involving the sugar industry at Torrington?

MR. CROGHAN: I think Mr. Browning did, yes.

MR. SAMSON: Who is Mr. Browning?

MR. CROGHAN: He is the District Superintendent.

MR. SAMSON: And where is he located?

MR. CROGHAN: Colorado Springs.

MR. SAMSON: He isn't tied up on this fire situation?

MR. CROGHAN: Yes.

MR. SAMSON: Is he up there?

MR. CROGHAN: Yes.

MR. SAMSON: What is your knowledge on what happened with the Governor, then?

MR. CROGHAN: I don't know anything about that. Oh, there was some discussion with Mr. Browning, but I couldn't say definitely what.

MR. SAMSON: Was that in connection with taking care of, so to speak, having the Council lay off the Torrington plant? I am talking about the Stream Pollution Control Advisory Council of Wyoming.

MR. CROGHAN: I couldn't answer that.

MR. SAMSON: You couldn't answer that. Well, then, those two things have happened since the first of the year?

MR. CROGHAN: Yes.

MR. SAMSON: Has there been anything done on the outfall there, this outfall that we have heard about here on these pictures? Has there been any mechanical change made in that outfall since last year?

MR. CROGHAN: Changes are in the process of being made.

MR. SAMSON: Have you started those?

MR. CROGHAN: Oh, yes, we have started.

MR. SAMSON: Where are those definite things being taken care of? Is that in the plant, in the tunnel, or is it at the river?

MR. CROGHAN: Between the plant and the river, a screening process.

MR. SAMSON: You haven't started to dig there to put those fixtures in, have you, of those screens?

MR. CROGHAN: Oh, yes. They will be in operation by the time the campaign starts.

MR. SAMSON: When did the plant place an order for those screens?

MR. CROGHAN: Well, the screens are on the ground ready to be installed as soon as we get some steel.

MR. SAMSON: And what is the nature of that steel?

MR. CROGHAN: It is to be shipped tomorrow.

MR. SAMSON: I see.

MR. CROGHAN: And it is prefabricated and should go together in a hurry.

MR. SAMSON: Now, what is that square hold that you are digging there north of the road, north of the gravel road that runs east and west north of the plant and west of the highway? That is a cement hole that you are digging in there?

MR. CROGHAN: That is the pit where these screens go in.

MR. SAMSON: That was started in the last couple of weeks, wasn't it?

MR. CROGHAN: No, that has been in process about a month.

MR. SAMSON: About a month?

MR. CROGHAN: And the concrete work is practically completed.

MR. SAMSON: You don't have the cement floor in there yet, do you?

MR. CROGHAN: They are pouring it today.

MR. SAMSON: Oh, they are pouring it today. But the reinforcement bars were being put in yesterday, isn't that right?

MR. CROGHAN: Yes.

MR. SAMSON: And that is where these screens go in?

MR. CROGHAN: That is right.

MR. SAMSON: So even if you had had the screens earlier, you would have had no place to put them because of the unfinished cement?

MR. CROGHAN: No, we had to build a foundation, a pit to support the screens and the other equipment. Of course, this screen, besides rotary equipment, includes a vibrating screen and also a house to house all of the equipment.

MR. SAMSON: Is there a tunnel that comes from the plant into this square box?

MR. CROGHAN: An underground thirty-inch tile sewer.

MR. SAMSON: Is that in place?

MR. CROGHAN: Oh, yes, it always has been in place.

MR. SAMSON: But you haven't opened up into it yet, is that right?

MR. CROGHAN: Oh, yes.

MR. SAMSON: I see.

MR. CROGHAN: It goes right through this pit.

I am very sorry, I am having a little trouble with my vocal cords today, I guess.

MR. SAMSON: I am sorry.

DR. SAMPSON: Mr. Croghan, when is it the campaign is expected to start?

MR. CROGHAN: The 2nd of October.

DR. SAMPSON: The 2nd of October. And the agreement between Holly Sugar and the Department of Public Health is that they would have those things in place and functioning by the 2nd of October?

MR CROGHAN: I am sure we will have.

DR. SAMPSON: That is what the agreement was. Until the campaign starts, these things have no value anyway.

MR. SAMSON: Thank you very much, Mr. Croghan. I think you have answered my questions.

CHAIRMAN STEIN: Do you have any questions? Do you, Mr. Clare?

MR. CLARE: No.

CHAIRMAN STEIN: Mr. Croghan, let me ask you, these screens will keep out the kind of beet debris we saw in that Pettersen screen or Pettersen dredge? Isn't that the kind of material that will be caught by the screens?

MR. CROGHAN: Well, we have a Link Belt traveling screen that is supposed to take out all of those chips and tailings, and so forth.

CHAIRMAN STEIN: What will be done with those chips and tailings?

MR. CROGHAN: What has been done?

CHAIRMAN STEIN: What are you going to do with them once you screen them out?

MR. CROGHAN: Haul them away and dump them on the ground.

CHAIRMAN STEIN: What is going to happen when the water drains from that?

MR. CROGHAN: Well, I think we will have it far enough away from the river that there won't be any drainage into the river.

CHAIRMAN STEIN: In other words, you are going to make provision so that it won't find its way back to the river?

MR. CROGHAN: We are going to haul it away from this screen, yes.

CHAIRMAN STEIN: I know eventually they are hauled, as I have seen other sugar beet operations, but generally they are set down to drain for a while before they are hauled away. The question is, what happens to the water as it drains off?

MR. CROGHAN: Well, I don't know whether I just understand your question or not.

CHAIRMAN STEIN: Well, you get all these beet chips and debris in these screens.

MR. CROGHAN: Yes.

CHAIRMAN STEIN: You pile them up on the ground somewhere and let them drain for a while before they are hauled away. They are not hauled away immediately, isn't that correct?

MR. CROGHAN: Oh, yes.

CHAIRMAN STEIN: What happens to the water that drains off that pile? Where does that go?

MR. CROGHAN: Well, these screenings should be comparatively dry, because after they go through this revolving screen they are pumped up and put over a vibrating screen, which dewaters them to quite an extent. They should be comparatively dry and there shouldn't be any drainage to amount to anything from that.

CHAIRMAN STEIN: You don't anticipate much of a drainage problem?

MR. CROGHAN: No.

DR. SAMPSON: I think I can clarify this a little bit. It is my understanding that this type of pulp, beet tails, and so forth, is salvaged and turned into feed. When they remove this, they remove a finished product, and these screens are over the sewer and this strained water is what discharges. In other words, what is the size of that screen? Art told us the size.

MR. WILLIAMSON: .185 inch.

CHAIRMAN STEIN: In other words, you expect all the strained water to go into the stream?

DR. SAMPSON: It goes into the sewer and on out.

MR. CROGHAN: There is a possibility we may be able to use these screenings for livestock food, but, on the other hand, there might be enough silt and fine sand in it that it would make it unsuitable for stock food. In that case, we would dump it on the ground over by our lime ponds. But it should be dewatered to such an extent after passing over the vibrating machine that it wouldn't drain to any great extent.

CHAIRMAN STEIN: Did you hear Dr. Neel this morning talk in terms of depletion of fish life and the wiping out of algae and fish food, and so forth, by sugar beet wastes below Torrington?

MR. CROGHAN: I am not in a position to say. I am not familiar with those kinds of problems.

CHAIRMAN STEIN: I wondered if you knew what you would accomplish on that by putting these screens in and letting the liquid go out, whether you would improve that or not or change it in any way?

MR. CROGHAN: It would certainly remove a lot of the fine stuff that is going through now, organic tailings and chips.

CHAIRMAN STEIN: I hope you appreciate our position. We have to look at the stream, and it is a question of the effect on the stream. In several other areas of the country where I have been on sugar beet problems, I have seen the material being held out for cattle feed or spreading on the ground and the liquid going into the stream. It seems to me in those places, and I don't know that this situation will obtain here, they seem to have a pretty serious problem in some of thoseplaces.

MR. CROGHAN: Well, I don't anticipate that we will have any drainage from this.

CHAIRMAN STEIN: This is not a question necessarily of the drainage. What I am talking about is you are going to have a highly organic material in solution going out, and I wonder what the effect of that will be on the stream, whether that will change the conditions described by Dr. Neel very materially.

MR. CROGHAN: The screening certainly will not eliminate certain colloidal and dissolved organic material.

CHAIRMAN STEIN: That is all. Mr. Clare?

MR. CLARE: Let me ask you a question. What do you call this waste line in which this screen will be installed? Is this a--

MR. CROGHAN: That is our main sewer line.

MR. CLARE: Main sewer. And it has what wastes in it, flume water?

MR. CROGHAN: Yes, flume water.

MR. CLARE: Essentially? And what else?

MR. CROGHAN: Well, returned water from the pulp silo after it is screened.

MR. CLARE: Lime cake drainage?

MR. CROGHAN: No.

MR. CLARE: You don't have that?

MR. CROGHAN: The lime cake all goes into a retaining pond and none of that goes into the river.

MR. CLARE: At the present time, then, this sewer is discharging, when the plant is in operation, to the river?

MR. CROGHAN: That is right.

MR. CLARE: And it is your proposal that you will install in this sewer line a screen?

MR. CROGHAN: That is right.

MR. CLARE: Which will remove the screenings or the materials which will be retained on the screen?

MR. CROGHAN: That is right.

MR. CLARE: So that actually the drainage from the screenings will be no different than the liquid from which the screenings were removed, is that correct?

MR. CROGHAN: That is right.

MR. CLARE: And this is a method of reducing the amount of material discharged to the stream?

MR. CROGHAN: That is right. I might say that this Link Belt screen that we have had in the past has broken down several times. It is very rugged construction. We sometimes get some rocks in with the beets and they jam in this screening and have broken the head shafts. Unfortunately, the pictures that were taken, I think, of tailings that you fellows saw this morning were taken right after we had one of those breakdowns. With this new screening that we will put in down at the river, anything that would get by this traveling screen, or in case of a breakdown, would be caught down there, so we will have a double screening device.

CHAIRMAN STEIN: Do you have any idea what kind of water quality this treatment will produce in the North Platte River below your plant as the water goes into the state line, what you are going to do to the stream by this?

MR. CROGHAN: I am just a little bit hard of hearing.

CHAIRMAN STEIN: Oh, I am sorry. Do you have any notion as to what effect this will have on the water quality in the North Platte River and how this will affect the water quality as it crosses the state line? After all, your company is making an investment in it to presumably improve the quality of the water.

MR. CROGHAN: Well, it will remove all tailings and fine stuff that can be retained on this size screen.

CHAIRMAN STEIN: I understand what it will remove, but what will it do to the water in the stream?

MR. CROGHAN: Well, I would say if you would remove a great quantity of fine organic stuff, it should improve the water.

CHAIRMAN STEIN: Will it improve it enough so it won't deleteriously affect the fish as described by Dr. Neel? Will it improve it enough so as not to affect the algae growth and the bottom life?

MR. CROGHAN: Well, Mr. Williamson said that there wasn't a great deal of reduction in B.O.D. at the present time, so if we eliminate this organic stuff that we screen out, it should be an improvement, I would think.

CHAIRMAN STEIN: Would you lower the B.O.D.?

MR. CROGHAN: I would think so, yes.

MR. SAMSON: Mr. Croghan, I realize you have been on your feet a long time and you probably didn't expect to go to work so quickly.

MR. CROGHAN: That is right.

MR. SAMSON: But I am referring here to some excerpts from the National Task Committee on Industrial Wastes. Mr. Jensen, I see, is here, and he is Chairman of that Task Committee. He may wish to comment on this. But this is a reference to that report by Donald J. Hardenbrook, who is of the Natural Resources Committee of the National Association of Manufacturers. Here is what he says about the beet sugar industry:

"The industry continues to add facilities which will improve the quality or reduce the quantity of waste water discharged from sugar and byproduct processing plants." The Committee goes on and says:

"The reduction in the pollutional characteristics of the waste waters is accomplished in various ways. During the past year, three new byproduct plants have been built to produce dried molasses beet pulp."

Now, I was wondering whether your company has manifested any interest in that direction?

MR. CROGHAN: Well--

MR. SAMSON: As far as Torrington is concerned?

MR. CROGHAN: We do have that in mind, I am sure, in the future. A drier was built at Hardin, Montana, this year, and there has been some discussion as to when we will put one at Torrington. I am sure we will at some time. I think it was a kind of a problem at the time as to whether they would put the drier at Torrington or at Hardin, but certain economic features entered in there and the decision was made to put it at Hardin, Montana.

I can't speak officially for the company, but I am sure a drier is something that will come along in time at Torrington.

MR. SAMSON: So many of these plants now, like Hiram Walker Distilleries at Peoria, Illinois, make more money off of the byproducts that come from their manufacturing than they do their main product.

MR. CROGHAN: That is right.

MR. SAMSON: Yes. Now, they go on here and say that the new screening facilities have been provided at six plants to remove additional organic solids from waste waters for the process use and other purposes.

You say that you are putting these screening facilities in operation and they will be in operation this fall, is that right?

MR. CROGHAN: That is right. We have had this traveling screen in since 1956, which has removed a lot of tailings and fine beet chips, and these have been fed to our livestock. We have extensive livestock feeding operations at Torrington. It is a possibility that screenings from this new screen may be used for that purpose, but there is also a possibility that there would be enough sand and silt in it that it will not make it suitable for livestock food.

MR. SAMSON: Then I notice there is one more sentence in here, "More interest is being shown in the use of algae in treatment ponds." I don't know what the benefit of that is, but apparently there is some conjecture on whether or not algae will properly take care of this problem. I don't know.

MR. CROGHAN: I imagine that is where they use lagoons. I don't know.

MR. WILLIAMSON: I might comment, that beet sugar wastes have been lagooned for years at other installations and nothing happens to them. They just sit there. So to actually get a lagoon to work like it does on sewage, you have first to dilute the stuff and then you are going to have to add supplemental feed to it to get them to growing. Then you might have a workable type of installation.

CHAIRMAN STEIN: May I just ask you one more question?

MR. CROGHAN: Yes.

CHAIRMAN STEIN: I hope it will be one. As I understand it, the liquid waste coming from the beet sugar plant is highly organic. As I also understand it, your new method of treatment does not intend any modification of that in any way as far as keeping it out of the stream, but just to let that water go into the stream. Is that correct?

MR. CROGHAN: That is the present system, yes.

CHAIRM STEIN: I don't have any more questions.

MR. SAMSON: I have nothing else. Thank you very much, Mr. Croghan.

DR. SAMPSON: Thank you, Mr. Croghan.

Mr. Long, would you have a statement you would like to make at this time or not?

MR. LONG: Doctor, members.

Of course, I thought we were going to come down here to listen and I hadn't really prepared any statement. You know, for the last six years we have had quite a lot of run-ins with the Holly Sugar Company, but I want to say this in defense of Ira Croghan and the other manager, supervisor or the factory at Worland, that they are not policymakers of the Holly Sugar Company. They are just holding a job. It is unfortunate and I know it is embarrassing for Ira to be kind of put on the spot, because none of the vice-presidents or any of them came in here to sit in to answer these questions and they are the policymakers. So I am saying that in his defense. I said this before the Wyoming legislature, so it is not new.

I want to say about our work on the North Platte River that when we started in six years ago they said we couldn't clean up the North Platte River. It is through the help of the industry and the towns that we have been able to do it. Who was it said that the water there just above the Torrington intake or the disposal there at the sugar factory at Torrington was fine? Well, it is that way all the way up now. The oil industry has spent something like--now, at Casper, the Standard of Indiana spent a million and a half putting in a sewage disposal in that one plant, and the oil industry in the whole State of Wyoming in the last six years has spent nearly ten million dollars to clean up their wastes. Now, that is just the oil industry. All of the rest, the Atomic Energy, the towns, and everybody, have put out money to take care of it. So we have had first-class cooperation in Wyoming, and I am very happy to tell everybody about it.

DR. SAMPSON: Thank you, Frank.

Mr. Christensen?

I would like to say just for the record that the plant at Hardin, Montana, had a very severe fire within about the past five days. Was that 37,000 barrels of oil that caught fire in one tank? Apparently this was intended to be their oil supply for this campaign. It is a major disaster and it is something that certainly these gentlemen had to look into.

CHAIRMAN STEIN: We should give the other Conferees a chance to comment and answer each of the speaker's questions.

DR. SAMPSON: Is there anyone else who would like to say anything else to Mr. Long, then?

MR. JENSEN: I would like to comment in defense of Ira Croghan.

I talked to Mr. Morris, Vice-President of the Holly Sugar Company, on Monday, yesterday, and he was of necessity in Hardin, Montana, to take care of a real critical problem he has there and he regrets very much he can't be here. If there is anything I can do to help in connection with this, I would be happy to do it.

CHAIRMAN STEIN: Thank you. We appreciate that.

Mr. Long, I think you realize that most of us up here, at least speaking for myself, are not policymakers either. We just hold a job. We are sent out here to ascertain certain facts and to get certain material. I think Mr. Croghan has given an excellent account of what the physical situation is here, and that is what I think we are largely interested in.

I don't know where anyone got the idea that you were coming to a meeting just to listen. (Laughter)

DR. SAMPSON: Mr. Christensen, do you wish to go on record too?

MR. CHRISTENSEN: Like the rest of you, I didn't come here to make any speeches and I am not really able to make a statement, but there are a few things I possibly could say.

As I have been listening here this forenoon to the remarks that have been made by Nebraska, I remember some forty-five years ago I lived at Plattsmouth, Nebraska, and where the Platte runs into the Missouri River there happened to be a swimming hole that I used to swim in. There was quite a bit of debris and stuff came down through there, and I never did realize that I would be here today and find out that it came from Torrington.

But, gentlemen, I appreciate the position that the Nebraska Board has taken, and I think good will come out of it in the long run. I have had a lot of experience and in reference, for instance, to the bill which was introduced in the Senate and in the House last winter attempting to define silt, which, of course, is mentioned in Webster in measurements, that had, of course, entirely reference to the silt, to the dirt on the beets, not to the part of the beets that goes down the stream.

We have experienced a lot of difficulties in many ways. For instance, the Natural Resources Board which was so illustriously mentioned here not long ago, while I have no proof, I am reasonably under suspicion that they were instrumental in the introduction of that bill. I have accused some of the members of it, but, of course, they deny that emphatically.

But be that as it is, we defeated the bill. I say "we". Frank Long and myself spent a considerable time, and Earle here, talking to the legislators telling them that it was an error.

The sugar companies did call on the Governor. It is only natural and it is not considered any more a disgrace to try to get away from paying taxes, and although expenses may be called deductible, we try to avoid them, which is not uncommon even to the sugar refineries.

The Holly Sugar Company while I have been on the Board, generally we have been on pretty good terms, has come along and made improvements, and we agreed last summer that we would go along to see what the result of their improvements would be. Now, you know and I know that the screens that they are installing will not remove the colloidal material that will come down the Platte River. That is not to be expected. It is too large an operation at once. It will come, but it will take a little time and you will have the same thing in Nebraska. I am sure that when you progress to the point where we are in Wyoming today, that you will agree that it is a hard row to hoe.

Thank you.

DR. SAMPSON: Thank you, Chris.

Does anyone wish to question Mr. Christensen? You will notice that he is a very able debater. He tells me his wife is in Denmark right now, so that gives him a lot of freedom.

MR. CHRISTENSEN: Oh, yes.

DR. SAMPSON: Mr. Burwell, would you like to speak to the subject, please?

MR. BURWELL: Gentlemen, I have only been on the Wyoming Stream Pollution Control Advisory Council for two years, but I have been in the legislature for a few terms and served as County Commissioner and on the County Board, so I have had a little opportunity to work with utilities and corporations. This stream pollution matter was one of my pet hobbies.

When I went down to sit on the Council, naturally, being a greenhorn, knowing very little except what I read in the newspapers about what the Stream

Pollution Council was accomplishing and doing, I kept quiet for a while. Finally I felt disposed to bring this matter up, because I have had occasion to come down this velley, I was with the gas company for over thirty years and working up and down the river, and did a little duck hunting, never any fishing down here but only because they have better fishing where I come from, but it seemed to me that it was a shame that that river was being so contaminated from the effects of that sugar operation there. Nothing personal. I used to live in Colorado Springs and knew quite a few people with the Holly Sugar Company and, of course, since I have been in this State here. But it didn't appear that we could seem to get over the hurdle at all and get anything done until just in the last year or so. I am not taking credit for it, but I think to keep me quiet they decided, somebody, to give us a little help and get it on the calendar when we have these meetings, because we didn't seem to be getting anywhere.

I think it is wonderful the progress that is being made so far, and I feel that the Wyoming Council is entitled to some credit now for trying to do their part on the other side, while it is just seven or eight miles over the line. We have got another one up in the basin country, but this is the one now that we are all concerned about and the testimony has been about.

The oil companies have been mentioned here. When I was appointed by the Governor on this Council, the highest official of the Standard Oil was in my area, at Casper, and of course everybody said, well, you probably want to get on the Stream Pollution Council because he wants to throw all the oil wastes into the Platte River and get away with it. I want to say that he just went right in with the Council and the State officials and others and, as has been brought out here, they spent millions of dollars and have done a wonderful job. It used to be that a polecat couldn't live in that river below Casper after it passed there because of the oil wastes and all and the odors. It would kill everything. No I think the water, as you all know, is very palatable more or less all along. The boys go swimming in it, cattle go and drink it and are not affected, and I think that we should give the oil companies credit, because they have spent lots of money. As far as I know, the Committee didn't have to take alibis every time they had a meeting. They just got busy and went to work.on it.

I don't know if Dr. Sampson was Chairmen of the Council at any time, I didn't have occasion to meet before the Council then but he was, I know, very active on the Stream Pollution Council and did everything he could with Standard Oil and the other two refineries at Casper and up around the basin country, through Montana, and out of Cody. They even collected out in the field all the oil wastes and they have been very, very cooperative and helpful.

It is too bad that this particular headache here keeps coming up and coming up before the meeting, and I hope the problem will be solved. I hope I live to see it while I am on the Council, not that I want to take credit, but I am going to keep harping on it to get something done.

I am glad to be here today.

DR. SAMPSON: Thank you, sir.

Does anyone wish to speak to what Mr. Burwell had to say?

Mr. Engendorff, do you have anything you would like to state for the Department of Agriculture for the State of Wyoming?

MR. ENGENDORFF: Dr. Sampson, members of the Conference.

I, of course, represent the Department of Agriculture for the State of Wyoming. Mr. Kirk, our Commissioner, is a member of the Stream Pollution Council, and in his absence I have had the opportunity to sit in on a number of the meetings. One only has to remember back a few years to actually know what we have done there in Wyoming. I have had the privilege of serving in Wyoming in this particular position for going on nearly seventeen years now, and I can well remember when we didn't have any stream pollution. I can well remember, of course, 1951 when we finally got the Stream Pollution Council and got it organized. Dr. Sampson has told you in his opening remarks, Art Williamson has told you in his comments, Frank Long has told you, and perhaps you folks will think that all of us are coming down here maybe tooting our horn a little, but we think we have a right, perhaps, to.

A lot has been done in Wyoming on stream pollution. It hasn't been all done, of course, and these men have told you that, and they are telling you that they are going to continue. A lot has been done on this North Platte River which you are directly, of course, concerned about.

One thing that we in Wyoming did do, we more or less started at the top and are working our way down. Apparently now we are down within seven or eight miles of the Nebraska line, and just because we are coming that close, of course, we are going to continue to work on it.

As I understand from sitting in with the Council in various meetings and from the comments that have been made here by our own people, and particularly the ones that Art Williamson made, although the work that we would like to have had done was a little slow coming, as far as Holly Sugar Company is concerned they have done or are now doing or are in the process of doing about all that the Stream Pollution Council today has asked them to do. If I am wrong, I can stand corrected on that, but I think that is correct. I don't believe that the Stream Pollution Council has told them that that is all they are going to ask, but that is all they have asked them to date and I think they have cooperated. This gentleman has repeatedly said that he will have certain things done by campaign season. I think we should give him a chance to see that it is done. If he says it is going to be done by October, or whenever it is, I think we should just wait and see if it is. I am sure from the relations that we have had with that particular company, and the other sugar companies that operate in our State up there, that when they say it will be done by then, it will be. And then it will be up to our Stream Pollution Council, if they still feel after that has been done and they have a chance to check the results--we don't know yet what the results will be--after those are checked and they talk with the sugar people again, maybe they have to go a little farther.

But I think we have had fine cooperation with our industries up there, and the Stream Pollution Council in Wyoming has done a wonderful job. They have done almost the impossible. I can recall back not too many years ago when many, many people, many, many of the legislators, Mr. Long, commented that you folks couldn't get done what you have done. You stuck with it. Sure, you will get a few people who will go to the Governor occasionally, that is their privilege, in your State and our State the same, but this Council has certainly not been influenced to the extent of not getting its job done.

Thank you.

DR. SAMPSON: Does anyone wish to speak to what Mr. Engendorff has said?

I would like to add for the record the fact that the complaint that has come to me most about that eight miles of stream is that duck shooting is very important along there, and that has not been brought out. I think that besides our very fine fishing in Wyoming, we should put in a plug for our good hunting in Wyoming too. In order to carry this forward, someone suggested the idea that one of the reasons we had the silt at the line was to keep the trout from getting into Nebraska so that the people from Nebraska could come up and buy Wyoming State licenses and fish. This is not strictly true.

However, in order to proceed from the standpoint of game and fish, we will now have Mr. Cliff Bosley, who has made some of the surveys, speak a word or two, if he wishes.

Cliff.

MR. BOSLEY: Thank you, Dr. Sampson.

If I may, I would like to give the Game and Fish Department's interest in this section of the Platte River. Of course, I am a fisheries man, so my remarks will be directed primarily toward the game fishes.

DR. SAMPSON: It is all right to put in a plug about the pheasants, too, isn't it?

MR. BOSLEY: Sure.

The North Platte River in this section of Wyoming is probably one of our most important trout fisheries. We realize that it isn't a good trout fisheries by any stretch of the imagination, but it happens to be the only body of water that we can rely on running the year round and having sufficient water to support a trout fisheries.

At the present time this area is confined from an area just above Torrington to about Lingle, and it is confined in this area because of the interstate canal which draws out a great deal of irrigation water and also the Guernsey Reservoir above, which stores water for this canal.

At the present time the trout fisheries' stocking policy is discontinued at the Coffer Dam. I believe Dr. Neel has a picture of it in Figure 1 in his pictures this morning of this Coffer Dam. We have a fair trout fisheries in that area. This stream throughout is pretty much a sandy bottom situation, so the Game and Fish Department has spent some money up above Torrington putting in trash gathering racks to collect floating algae, pieces of debris, and we are trying to actually create a habitat here for game fisheries.

And the area down below Torrington, I think our findings pretty much go along with Dr. Neel's. We find very little game fish in the area below. Although some game fish do drift into the area, they are confined to the side of the stream away from the effluent. Unless this situation is cleared up, I don't know whether there is any possibility of extending the trout fishery down to the Nebraska line or not.

That is all I have, unless there are any questions.

DR. SAMPSON: You can tell them how much out-of-state licenses are. (Laughter)

Does anyone wish to speak to this?

MR. CHRISTENSEN: Dr. Sampson.

DR. SAMPSON: Yes, Mr. Christensen.

MR CHRISTENSEN: There was one thing I wanted to bring out that I forgot and I want you gentlemen from the National to understand, that when you sit in a State like Wyoming with a cowboy legislature, we are pretty much controlled, we can only go so far, which we are confronted with. Now, if you can help us, it would be welcome. But we can only take the line like Hitler mentioned in Mein Kampf. You know? In other words, we have to make each offense small enough that it is not worth fighting over.

That is the position that we have to take with such a company as the Holly Sugar Company, because we are not able to fight. We have a bill in the legislature that will stop us cold. And it will stop us, I don't mean maybe.

So I am asking for help, and I hope that we get it.

DR. SAMPSON: Thank you, Chris.

Mr. Gibson, do you wish to speak to this matter, please?

MR. GIBSON: Dr. Sampson and gentlemen of the Conference. I am like my good friend, Mr. Long over there, I came down to listen this afternoon. I am certainly sorry that I was not here this morning to hear what went on. I probably would be a little more able to talk along the lines of what your remarks were this morning.

DR. SAMPSON: Mr. Gibson, while he is coming forward, I might state, is a former member of the Stream Pollution Council and a resident of Torrington, a member of the City Council there.

MR. GIBSON: I believe at the present time I had better keep my remarks strictly in line as a member of the Torrington City Council, since we have the new Council here from the State of Wyoming.

I was one of the original members of the Stream Pollution Council when it was organized. Up until two years ago I was on that Council, have been a City Councilman all that length of time also.

What I want to maybe take exception to right at the present time is the remark that the gentleman who said he used to live at Plattsmouth made about the pollution from the North Platte River going into Plattsmouth being from Torrington. I would like to have him clarify that a little bit. I don't think that it all came from Torrington. If I might state, on our way down here today we saw on this side of the line several large feed yards along the Platte River that probably were putting into the Platte River as much or more than the Holly Sugar Company or the Town of Torrington was putting into it.

Anyway, as I say, probably I may be out of line on that because of some of the remarks that were made this morning, and I am sorry that I wasn't here to listen to them. But that is one thing that I feel, that we of Torrington have certainly cleaned up our town. Any of you gentlemen who were there this morning or have been in the last few weeks have had the opportunity to see our pollution ponds. We think that we have the best in the State. Aside from Buffalo, where Frank is always a jump or two ahead of us, we were the first ones to have this stream pollution pond in the State. Buffalo beat us by some about thirty days, I think. Anyway, we now have two in operation. To any of you gentlemen who are contemplating putting in a pond, let me say this, take the size that you think you are going to need and then double it and you will be just about sure of having the right size pond.

We are very proud of our pollution plant up there at the present time. We think it is working very good, and I don't think that any of it is coming down into Nebraska at the present time. I think, as I say, we will just confine it to the City of Torrington at the present time, although in defense of the Holly Sugar Company I will say this, that they are trying. Those boys, I know, have worked very hard this summer. As you know, they have only had the summer months to put in this new type of plant that they are putting in, and they have kept a crew working this summer very hard to get this job done. I know they are going to run very close to campaign time to get it in, but I am sure they are going to get it in. When it is in, as my friend Mr. Croghan stated, they will take all the large particles out of the stream, and I am sure that the duck hunters this winter won't have the complaint that they had last year of all the foam and the tailings from the beets getting into their blinds and fouling up the duck hunting. I just feel sure that they won't have that.

Thank you.

DR. SAMPSON: This is the Wyoming group. Is there anyone else from Wyoming here that I have overlooked who might want to make a statement?

Is there anyone else from the sugar factories who might want to make a statement in defense of sugar factories in Wyoming?

MR. JENSEN: I think, Dr. Sampson, I would be the indicated person at this point. We do have a plant in Wyoming.

I have always had the feeling, and since we have been in this business and we are polluters, that the problem can be solved only one way, and that is by joint efforts of the State people and the industries and municipalities or any others that are involved. Particularly because all the beet sugar plants are quite old, they were built before the days when any thought at all was given to waste treatment or pollution abatement, it is a real difficult problem to be solved. It can only be solved by a real effort on the part of the industry itself to want to solve it. I can assure you we have that feeling about it, we understand the problem, and our relationships with the Wyoming Stream Pollution Control Advisory Council have been excellent.

On our behalf, I think that we have contributed something to your solution of the problem.

DR. SAMPSON: Thank you, Mr. Jensen.

I think, Mr. Stein, that we have made our statements. We now stand ready to answer questions if they are directed to us, or if you have something that you would like to now present from Nebraska, whichever way you want to handle it.

CHAIRMAN STEIN: Are there any questions on any of the Wyoming statements?

I would like to say, Mr. Christensen, in relation to your remarks, I think from a national viewpoint we all recognize that Wyoming has had one of the best programs, large or small State. Certainly for the size of your problem you have, I think, done an outstanding job, and we have so stated that, I certainly have, in writing on several occasions. I think you have handled a very difficult problem with an oil industry, which is a very vexing problem in many other States, very well. I think that you have done a very good job with the uranium milling industry, which has been a troublesome problem in many of the other States, and various other problems, and also with your municipal wastes.

I do think that it is characteristic of the Federal role in this that we generally do come up, paradoxically, in these interstate cases, particularly situated as we are here, with the States that have the stronger and more active programs. I think this has always been the case. I think when we were on the Missouri River, the State of Missouri had done an excellent job and most of the places were cleaned up. It was just that certain places stand out when you do a cleanup job that requires a lot of action and joint action by all concerned. I think Nebraska in turn has had within the last several years a very active pollution problem, and that is why we are here.

There is one thing about this business. Chicago, for instance, has a pretty good municipal water supply. On five days a year they get some taste and odor problems, possibly due to refinery wastes coming in from the Great Lakes. When they get those taste and odor problems, the telephone at the water company doesn't cease to ring and the newspapers are full of it. Everyone is excited and they are calling Washington. You go to some other areas of the country where every day in the year the water is worse than on the worst day in Chicago, and yet the people have gotten used to that and they don't begin to complain. I think that this really is, in a sense, when you are down to the last few miles of a stream in a State. I really do think it is a compliment to the State rather than anything else that we are all getting together on this problem.

Does anybody want to present anything, Mr. Samson, or Dr. Rogers? Who would like to go first?

MR. SAMSON: I don't care. It doesn't make any difference.

DR. ROGERS: Go ahead.

MR. SAMSON: Dr. Rogers, if you don't have any objection, I will go ahead.

DR. ROGERS: Go ahead.

MR. SAMSON: Dr. Sampson, I have easily grown to love, respect, and admire you. You are a man of a lot of ability and many capabilities.

You know, you were talking about the meeting last year. That was a grand meeting, and we were tickled to death to have you in here and we told you that we would like to have you back again. So we have invited you back. And, Doctor, we told you that if you had any serious problems in Wyoming, we would be glad to take thm up with you, and we just thought that this might be the opportunity to take those problems up with you.

So, Doctor, I love you, and I think you are a great fellow.

DR. SAMPSON: Thank you.

MR. SAMSON: Well, gentlemen, belatedly I welcome all of you to Scottsbluff and tell you how pleased I am to see so many distinguished people assembled here interested in the common cause of clean water. I believe that I know most of you. You know me. I am a member of the Nebraska State Water Pollution Control Council.

As you know, on July 21st of this year the Council requested the Surgeon General of the Public Health Service to call a conference under authority of Section 8 of the Federal Water Pollution Control Act as the first step in abating pollution of interstate waters of the North Platte River below Torrington, Wyoming. In compliance with the request, this conference was called. We were reluctant to ask the Surgeon General to take this action, since we recognize that the primary responsibility for cleaning up this stretch of the river rests with the State of Wyoming and the State of Nebraska. However, after giving due consideration to the extended period of time that this stream has been polluted, the failure or the inability of our State and local agencies to substantially reduce the quantity of such pollution, and the disturbing report on the present condition of the river as revealed by the Public Health Service investigations in November and December of last year, we had no other choice. It was the consensus of the Council that this conference had to be called as a last resort to stop the continued degradation of the river.

Those of you who have seen the 1960 Public Health Service report, and who have heard Mr. Kittrell's and Dr. Neel's able presentations here today, will recall that the investigators found the waters of the North Platte above Torrington to be beautifully clear and sparkling, with all the appearances of a clean stream. The tests substantiated the fact that the stream was clean at this point. Aquatic life was found to be normal, as we just head a few minutes ago from the Game Commissioner representative of Wyoming, coliform bacteria was quite low, dissolved oxygen was high, and B.O.D. and suspended solids were low.

Most of us already know what happened to those clean, crystal clear waters between Torrington and Broadwater, Nebraska, during the sugar beet campaign. We were reminded of it by the Public Health Service report last year and today by Mr. Kittrell and Dr. Neel. This stretch of the river, might I refer to, is somewhat of an open sewer. We cannot permit its major use to be a conduit to carry away municipal and industrial refuse and, therefore, interfere with the water uses.

We in Nebraska know of the quantity and kind of municipal and industrial wastes being discharged into the stream in this State. We admit --and I want to make this abundantly clear--we admit that if the stream were sparkling and clean across the State of Nebraska, Nebraska's wastes alone would pollute it. We know that. We also know that substantially the same conditions have prevailed along this stretch of the river for more than ten years. As Mr. Kittrell told us today, in 1950 the Public Health Service, in cooperation with the Bureau of Reclamation and the water pollution control agencies of the States of Wyoming, Nebraska, and Colorado, conducted an investigation of the pollution of the North Platte River basin. The results of this investigation were included in a report released in January 1951. It was concluded in this report that from Torrington, Wyoming, to Lewellen, Nebraska, the condition of the North Platte River varied from grossly polluted to moderately polluted, that public health hazards and nuisance conditions of the river resulted from the practice of discharging untreated municipal and industrial wastes into the stream, and that a large portion of these wastes were due to seasonal loads contributed by industry. The report recommended the installation of adequate municipal sewage treatment facilities by Torrington, Wyoming, and by Lyman, Mitchell, Scottsbluff, Gering, Minatare, Melbeta, Bayard, Bridgeport, Broadwater, and Oshkosh, Nebraska.

Now, let me vary from the prepared text here for just a moment and say that the Great Western Sugar Company has installed, as I understand it, a full treatment plant down at Bayard and has done a lot of work and spent a great deal of money at Mitchell, Scottsbluff, and Gering.

The report also recommended that all toxic materials be kept out of the river and that satisfactory waste treatment facilities be provided by the Holly Sugar Company, Torrington, Wyoming, the Great Western Sugar Company at Mitchell--and the Great Western, as I have already commented, somewhat has been taken care of--the Great Western Sugar Company of Scottsbluff, the Great Western at Bayard, the Great Western at Gering, and the Cooperative Oil Company of Scottsbluff, Nebraska, and Swift Packing Company at Gering. Much of these improvements have been done, have been accomplished by the Great Western, so this report of 1951 then must be modified.

It was also recommended that caution be exercised in the use of sewage polluted irrigation waters for low-growing vegetables and root crops which would be consumed raw, that all of the effluent from the existing sewage treatment plants be chlorinated, and that public water supplies obtained from surface waters in the basin and from shallow ground sources in the vicinity and all water supplies in the area showing coliform counts in excess of those acceptable for drinking waters be chlorinated in addition to other standard treatment. Most of this has been said and read before, but I think that it bears repeating, since this was the condition of the river ten years ago.

Today the North Platte from Torrington to Broadwater is as polluted as it was in 1950. Even with the Public Health Service report, we know now, and have known for many years, that we can't use this stretch of river for drinking water, that there are no fun fish in areas of it, and that it isn't safe for swimming or bathing. What is worse, we know the condition of the stream today poses a serious and constant threat to the health of the population living in the vicinity who come in contact with the water.

This is a challenge of our polluted Platte. What is the answer?

Speaking for the State of Nebraska, I would like to make this proposal. I am confident that the responsible agencies of the State of Wyoming and Nebraska and the municipalities and the industries involved, working together as a team with the Public Health Service, are capable of launching an all-out effort to restore the water of our river to most of its many benefits and God-given uses. And I know that such an effort will be crowned with success. I propose that we here today agree on the steps that will be taken to reduce to an absolute minimum the quantities of wastes that are to be discharged into the stream, and on the necessary facilities that will be built to give these wastes the absolute maximum of treatment before they are discharged.

Having agreed on this, let us then agree on a reasonable, practical time schedule for the installation of those facilities and for the commencement of their operation. We have been talking about this mess for well over ten years. It is old hat to many of us, I am sure. I propose that we stop talking and start acting. I am a firm believer in the old adage that God helps those who help themselves. Let us help ourselves here and now, so that the Platte from Torrington to Broadwater will be as pretty and as clean and as useful as it is above Torrington.

I feel that I can say without any mental reservation whatsoever, and that it is the feeling of the other members of the Water Pollution Control Council of Nebraska, that the National Credo coming out of the National Conference on Water Pollution, Washington, D. C., in December 1960, as follows:

(a) Users of water do not have an inherent right to pollute;

(b) Users of public waters have a responsibility for returning them as nearly clean as is technically possible; and

(c) Prevention is just as important as control of pollution,

is a fundamentally sound policy.

Thank you.

CHAIRMAN STEIN: Are there any questions? Any questions from Wyoming?

DR. SAMPSON: I do have a question. I don't know whether Dr. Rogers wants to make a statement first.

CHAIRMAN STEIN: We can do that.

Dr. Rogers?

DR. ROGERS: Yes, I do have a statement of my own and some that have been submitted.

DR. SAMPSON: He might answer my question when he makes his statement.

CHAIRMAN STEIN: Dr. Rogers.

DR. ROGERS: Very well.

I am Dr. E. A. Rogers, Director of Health for the State of Nebraska, and the Executive Secretary of the State Board of Health. I might say that the State Board of Health has not had an official meeting since the call for the conference came from the Water Pollution Control Council, and, therefore, I do not have an official statement from my State Board of Health as such. However, I do feel that I speak for the State of Nebraska, Department of Health, and State Board of Health in this statement that I have prepared, and I will read it verbatim.

Nebraska has always been proud of its natural resources and has taken every reasonable measure to abate undesirable conditions and to prevent any degradation of its environment.

To this extent, the Nebraska Department of Health has never approved any new sewerage systems or additions to existing sewers unless treatment of the sewage was already provided or was a part of the project. The policy of the Department was that no untreated wastes should be discharged into any lake, stream, creek, or dry valley. Even though stream pollution abatement programs usually have the stream in mind, the Health Department takes also into consideration the potential hazard of dissemination of bacteria always found in human wastes. These should never be discharged or be permitted to foul the environment without being destroyed or at least decreased in number. Streams receive most of the wastes discharged from sanitary and industrial sewers. Effort has been concentrated in the disposal of these wastes. Therefore, waste treatment and stream pollution control are closely related.

This general policy is well accepted by municipal officials and officials of industries. In planning waste disposal, treatment is a part of the program.

The Nebraska Water Pollution Control Council adopted the same policy and officially adopted the Water Quality Objectives of the Missouri Basin Engineering Health Council. These objectives have been published and distributed to all municipal officials, together with suggested construction dates. To date, no objection has been brought to the attention of the Council, and, surprisingly, several muniicpalities already constructed treating facilities ahead of the suggested schedule.

The Department of Health has been reluctant to ask for a conference on pollution of waters entering Nebraska from Wyoming, because up until now no program of importance was in effect in the area just east of the state line.

We are now proud to report that the city officials of Scottsbluff have active plans for construction of sewage treatment facilities. The Great Western Sugar Refining Company has already constructed treating facilities at several of its plants and has plans to complete the program in the very near future.

The city officials of Gering have their engineering studies completed, but upon advice of the Water Pollution Control Council have deferred construction until further studies indicate whether Swift and Company should build their own treating facilities or should discharge their wastes into the Gering works. This study is now under way and we were given to understand that construction may be expected by fiscal year 1963.

The bulk of pollution of the North Platte River comes from these sources. Since active plans are now under way, it is our opinion that we are in position to ask that any waters entering this state have the same quality that we are trying to maintain. Since the Missouri Basin Water Quality Objectives were adopted by both Nebraska and Wyoming, it is our request that all parties not only agree to the objectives but also agree to comply with them.

We, therefore, request that such necessary steps be taken to realize the objective set forth as quickly as possible.

That is the end of my statement.

This morning we had with us a member of our State Board of Health, Mr. George R. Myers, who is a resident of Gering, and I am sorry that he had to go back to Gering to take care of his business there. He did leave a short statement with me that I would like to read in his behalf.

"We believe that all discharged wastes should be treated. The City of Scottsbluff and the City of Gering now have active plans for construction of sewage treatment facilities.

"We think it is only proper to ask that any waters entering this state be the same quality that we are trying to maintain."

Signed George R. Meyers, R.P., Member State Board of Health.

This morning I received a letter forwarded to me through the State Health Department offices from A. H. Story, who resides at Plainview, Nebraska, and who is a National Vice-President of the Izaak Walton League of America and is also Chairman of the Nebraska Division Pollution Committee. He asked that this statement that he has prepared be read into the record, and so I shall read this for him as a part of the Nebraska presentation.

"Izaak Walton League of America, Nebraska Division.

"The Izaak Walton League of America, since its inception some forty years ago, has led the nation's fight for clean waters through prevention and abatement of water pollution. Not only in Nebraska, but over the entire nation, the various chapters and state divisions have led the way in countless pollution control advances. Even more important is the challenge facing us in the future as pollution spirals, communities expand, and industry burgeons. Clean, usable water has become the basic limiting factor of almost every community in America. Water is one of America's most basic resources.

"One of the key objectives of this organization is the safeguarding of the public health and the conservation of all forms of life brought about by the elimination of pollution to our water resources. Clean, pure water is the basic ingredient of any and all defense programs, because it is basic to the health of the people, to industry, to agriculture, and to every other element of our society. The water we use for drinking and other domestic purposes, such as for raising agricultural crops and livestock, and for recreation, must be carefully safeguarded in order to assure a healthful population.

"Throughout this entire Midwest, streams and rivers are rapidly changing. With the new dams being erected, sediment--once a natural blight--is fast becoming no longer a problem. The water has become almost clear in many of our rivers, except for sewage and pollution. The dams are stabilizing our rivers and are helping to contain it in a fixed course or channel. These factors will tend to provide for an even greater use of the water itself.

"We in Nebraska are very proud of the progress which has been made in the past few years of meeting the pollution problem. Treatment plants for sewage have been springing up all over our state, and more are in the immediate planning stage or under construction. The Missouri River, bounding us on the east and north, is rapidly becoming one of the scenic areas of the Midwest, and the cities and villages along its course are meeting the pollution problem with responsible action. The Blue, the Niobrara, the Republican, the Loup--along with the Platte River--are gradually improving and becoming cleaner, more beneficial waters of the state.

"Pollution of any waterway might well be called a crime against nature and society. Modern civilization cannot condone such a practice in regard to its basic resources. The Izaak Walton League will continue to fight all forms of pollution and work toward the day when we can be proud to leave to our childeren the clean, unpolluted waters that nature intended and that all humanity requires. It is our contention that no heavily polluted water should enter this state, and that we shall not be guilty of discharging any polluted water into any bordering state. Water, as air, is most vital to our entire way of life and should be treated as such.

"In summation let me repeat, water is one of the nation's greatest resources. Without it, we cannot exist. Let us preserve it in its most beneficial form--unpolluted. The North Platte River, which flows through the heart of Nebraska, is one of the state's richest assets. It is our obligation to mankind to make certain that it enters and leaves this state unpolluted, clean, and of beneficial use to those who use it. The recreational, industrial, and agricultural use of this river demands that it be purified and kept in a healthful, unpolluted state.

"Submitted by A. H. Story, National Vice-President Izaak Walton League of America, Chairman Nebraska Division Pollution Committee."

I also have been given a statement from the League of Women Voters of Nebraska, with the request that it be read into the record at this conference.

"The League of Women Voters of Nebraska, 2702 Sharon Drive, Omaha, Nebraska.

"Statement of Mrs. George Work, President, League of Women Voters of Nebraska, to the conference called by the Nebraska State Water Pollution

Control Council.

"The League of Women Voters, as the result of five years study of the use and conservation of our water resources, have become convinced that one of the most effective ways of insuring adequate water for our present and future needs is to promote universal control of pollution. Water can be used and re-used until it has all evaporated if it can be kept clean. From this premise, we heartily applaud the conference called by the Nebraska State Water Pollution Control Council to investigate the pollution of the interstate waters of the North Platte River leaving Wyoming and entering Nebraska.

"Although Nebraska has no local Leagues in the stretch of river between Torrington and Broadwater, we have covered this area in the study we are presently preparing on the Missouri River and its tributaries. We are aware that sugar beet mills and canneries contribute seasonal pollution that presents special problems, because the peak of their operations coincides with a period when the river has its lowest flow of water. Obviously this causes a concentration of contamination which is most objectionable. In the fall of 1960 a sugar beet mill in Wyoming was discharging 28,000 pounds of organic solids a day into the North Platte. This is equal to the raw sewage discharge of 167,000 people, which is about half the population of Wyoming. Nebraska is contributing municipal wastes to a lesser degree into the lower stretches of the river. The League of Women Voters feels that it is important that the states work together to solve their mutual problems in this area.

"I believe that the State of Wyoming is sympathetic to a fair solution of this problem. A sugar beet company there had a bill introduced in the 1961 legislature which would exempt it from complying with Public Law 660. The League of Women Voters of Wyoming was active in opposing this and the bill died in committee.

"We hope this conference will result in cooperation between the states to relieve the pollution problem."

That is the end of the statement.

CHAIRMAN STEIN: May I just make a statement for the record, and I think this is just factual, that if the bill had been passed I don't think it would have exempted it from the operation of Public Law 660.

DR. ROGERS: That is the end of the presentation that I have to make, Mr. Chairman.

CHAIRMAN STEIN: Are there any comments or questions now, or would you prefer to wait until Nebraska has completed its presentation?

DR. SAMPSON: I think I would prefer to wait.

CHAIRMAN STEIN: Do you have any other people to call on from Nebraska?

DR. ROGERS: I would like to give anyone in the audience an opportunity to make a statement if he cares to. I have not heard from anyone who does wish to make an oral presentation. Perhaps Mr. Samson knows of someone.

MR. CHRISTENSEN: Could I ask a question off the record?

CHAIRMAN STEIN: Yes. Go ahead.

(Off the record)

CHAIRMAN STEIN: Could we go on the record and repeat your question?

MR. CHRISTENSEN: Put it in the record, then.

DR. SAMPSON: Such modesty is unusual.

MR. LONG: What is the matter? Are you all right?

(Laughter)

CHAIRMAN STEIN: Do you have Mr. Christensen's question without his repeating it?

MRS. RANKIN: No.

CHAIRMAN STEIN: Would you want to repeat your question?

MR. CHRISTENSEN: Yes. I would like to know if the Robert Taft Institute or the Mellon Institute or one of the institutes that are making research on pollution have made any particular study of abatement of the pollution arising from the sugar factories?

CHAIRMAN STEIN: Maybe Mr. Kittrell can answer your question specifically for the Public Health Service laboratory in Cincinnati.

MR. KITTRELL: We have not made any study directed to beet sugar wastes themselves. There are, of course, certain fundamental waste treatment processes that my be applied to beet sugar wastes as well as to other wastes of a similar nature, but we have not, answering your question specifically, made investigations of a research nature specifically on beet sugar wastes.

CHAIRMAN STEIN: Mr. Jensen, do you want to comment on this?

MR. JENSEN: Yes.

There was a joint study made at Bayard, Nebraska, by the U. S. Public Health Service, Nebraska Department of Health, and the Wyoming Department of Health on the treatment system that is in effect there now, and there was a publication made on that, just for the record.

CHAIRMAN STEIN: Thank you, sir.

I think, Mr. Christensen, I would like to make one comment. I think this is generally accepted in the entire country, that when an industry puts out a waste it is that industry's responsibility to provide the corrective measures to handle that waste. It is not a Governmental responsibility, whether state or Federal or any other, to do that. Our responsibility is to deal with the conditions in the stream and water pollution and see that the wastes hopefully do not interfere with legitimate uses.

However, we do, as you know, have a research program, and obviously part of our program is designed to deal with troublesome waste problems, particularly from the Federal point of view, first which are of regional or national importance. Now, if this becomes identified that the sugar beet industry is faced with a very difficult problem where there are no feasible means of doing this and the industry itself feels that this is the kind of area that they want Government help with, there are avenues to do this. But this is an area somewhat outside of this. This does not change the responsibility for treating the wastes, however, or shift it from any industry.

This does not apply just to this industry, but it is any industry. Any manufacturer who puts out a new product has to be sure he puts out his product in such a way that it will not interfere with the health or safety of the American people. This is the general rule we have for all manufacturers.

MR. CHRISTENSEN: Well, you understand that it is quite easy to place responsibility, but in a long-established practice it is difficult to eliminate it.

Here is a sugar plant that has been operating for twenty-five years and no one has taken exception, until all at once we come out and say, no more dumping into the river. I can assure you that when anyone reads, well, the fishing has gone on the Platte River from Torrington to Bayard, nobody pays any particular attention, but when they read in the paper, in the morning paper, the local plant that employed ten people has closed down on account of it, they tip over backwards in their chairs and call the local Chamber of Commerce immediately.

So now we are confronted with the deal that here is an industry, a large industry, employing many people, not only in Torrington, it may be in Lewiston, Idaho, or it may be in Scottsbluff or anywhere else, and we say, you have got to stop it. Are they not entitled to say how?

CHAIRMAN STEIN: Mr. Christensen, let me say this. This October is going to be my twenty-first year in the Government, and I have specialized in this field. I have seen a great improvement in water pollution control. I have heard the argument advanced many, many times about industries closing because of this. I have yet to see substantiated the first case of an industry closing because of a regulatory action of a state or the Federal Government in water pollution control.

I will make certain little exceptions for that. There were a certain few oil wells involved in some cases which closed. The reason they closed, in my opinion, and I think everyone will agree to that, was that they were so tied up in many, many estates and so divided up that it was a problem in closing the oil well. They weren't very productive anyway, and actually when the enforcement action came around, this gave them an excuse to liquidate the holding and plug the well. But these were marginal wells.

Other than that, in over twenty years' experience, I haven't seen an industry close. If anyone has that information, I would certainly like to get it.

I would like to say that we take into consideration the equities involved. No one is talking about closing any industries. We do have an obligation here. You say you have three million people coming into Wyoming during the summer. The reason you have those people is because you have clean water. I think Nebraska, too, is entitled to have clean water and a crack at those people.

The question here is that a state has a right to expect in an interstate situation waters coming across the state line in a reasonable condition. No one has even remotely mentioned the possibility of a shutdown because of pollution control measures of any industry in this area or any other. This is not our object.

MR. CHRISTENSEN: That is not what I meant exactly, although it was interpreted that way. In other words, we ask for some technical help. We are short. We are limited. Our legislators limited our Health Department to a minimum. We are short of help.

CHAIRMAN STEIN: We will get to that. We are very able--I don't know how able we are, but we are willing to provide help and technical help. I do have to make, though, this distinction, and I would just like to use another example other than this industry to put the question. We are prepared to give technical help, and I know we have talked with Dr. Sampson about this before. The question here is to give help to ascertain what is in the stream and what can be done and let's put into effect what we know how to do now.

Let us not use research, and goodness knows we need it, to handle all these problems. Let us not put into effect using research as a subterfuge for a lack of action, because I remember back many, many years ago this argument was advanced when we first started dealing with the pollution problem in the petroleum industry. The argument was, let's put our money in research and find a real simple way to get rid of these oil wastes and the petroleum industry would like to do it. Well, this has been a period of pretty close to twenty years. The petroleum industry for the most part either uses reinjection oils or lagoons. So far there hasn't been that research breakthrough. If we had waited we would still have those streams polluted, and you may very well have had them polluted in Wyoming from the petroleum industry by waiting for that research break to come through.

I think that is what we have to understand. We can, and the Federal Government is prepared, particularly on an interstate stream and when we are asked by the state, to give you all thetechnical help within our resources, but we also would expect both the municipalities and the industries, where it is appropriate, to put in reasonable and feasible methods of treatment.

MR. CHRISTENSEN: Thank you. That answers my question very nicely.

DR. ROGERS: Mr. Chairman.

CHAIRMAN STEIN: Yes.

DR. ROGERS: May I ask if Mr. Burk would care to make any remarks as a member of our Water Pollution Control Council, or a representative of the Great Western, either one, or both?

MR. BURK: I think Mr. Jensen will probably speak for me. I am industry representative on the Nebraska Water Pollution Control Council. I have been on it since its inception four years ago, and the work that I have helped do, I think, has gone a long ways towards cleaning up Nebraska's streams.

However, the section of the country I live in has been under indictment today, and justly so, I think. I am not going to talk about what the Great Western has done, I would like to have Mr. Jensen do that, but I would say that the cooperation we have received from everybody in the state in cleaning up our streams has been magnificent. The new law that we had passed this last year has helped, and I am sure that while the most of the reports you have heard today indicate that Nebraska is lagging quite a little on this stream pollution, it has been a terrific job, and I think our municipalities and our industries are to be congratulated in getting as far along as they have.

Thank you.

DR. ROGERS: That is all I have.

MR. SAMSON: There is Lloyd Jensen and also the boys from the Game Commission.

DR. ROGERS: Mr. Jensen, do you care to make any further remarks?

MR. JENSEN: Yes, I would, Dr. Rogers, Thank you. I will come up here.

I am sorry I don't have a formal statement to help out the stenographer, but I will try to talk clearly.

It would probably be worth-while if I would spend a few minutes telling you something of the beet sugar industry, inasmuch as today seems to be our day. I feel somewhat like Perry Mason trying to defend myself today, but I will attempt to point out to you what I think are the pertinent facts in our problem and what we are doing and having done about them.

First of all, I want to cleave a line between industrial wastes and sanitary sewage. I don't think we ought to talk in the same terms about the two types of wastes. I even dislike the use of population equivalents for industrial wastes, because it sort of infers the idea that there is something concerned with sewage in industrial wastes, which is not necessarily true.

Sugar factory wastes are not pathogenic, they are not toxic to human beings. They are oxygen depleting wastes and they are the insoluble materials that are discharged.

In 1940 Great Western Sugar Company had six plants operating along the North Platte River confined in the same area as we are talking about today. As I stated before, there was not one single bit of effort made to reduce the pollution caused by the discharge of the wastes of those six factories. By 1950 we had closed down two of these plants, partly for lack of raw material and partly because we felt we had too many units and were trying to get more efficient, and everything else.

In 1950 we became seriously concerned with the pollution problem in our company, and we started out and worked with the U. S. Public Health Service. I think our industry was one of the first ones to come out with an industrial waste guide, that was printed by the U. S. Public Health

Service, which shows what the various kinds of wastes are from a sugar factory and what their relative strengths are. We were frank to admit we had a real problem. I often wished I had gone into some other business just because of this, because it is a terrific one. Nonetheless, it is difficult here because we are practically the only large industry in the valley, and so we get the finger put on us pretty easily.

Nobody today has mentioned particularly the economic aspects of this, and I don't want to dwell on it because it is an indefensible position in some ways, but nonetheless the degree of pollution abatement necessary and the cost of that pollution abatement should have some relationship to what kind of water is required in this stream for what kind of purpose. Now, certainly in the North Platte Valley the water is principally used for irrigation. It is my opinion that at the moment it is not necessary to have the North Platte River cleaned up to the degree necessary to use it as untreated municipal water supply. I am not saying that ultimately will not be the case.

The sugar industry is a non-consumptive type of industry as far as water is concerned. We return as much or more water to the stream than we take out. Here in the valley we take nothing out of the river; we take it out of drain ditches or wells and then return it to the stream, but in equivalent amount. Nearly all the water is used for cooling purposes, the bulk of the water because our raw material is only twenty percent dry substance and we have to evaporate a lot of water out of it before we get our dry product.

I would like to point out the different kind of wastes. I think Mr. Stein asked the question of Mr. Croghan today, and I think that maybe he misunderstood, too, some of the types of wastes that were related. First of all, there is the waste from the removal of sugar from the beet. Those are called pulp water wastes of one kind or another. There is a waste called lime cake. This is a waste that is produced from precipitating calcium hydrate in the sugar solution to purify it. It goes out as both a mineral waste and with it takes a good deal of organic matter. It falls both in the area of being an organic pollutant and being in the area of settleable solids.

In some factories in the valley, we have two that have the Steffens process, they reprocess molasses. This process involves removal of sugar from molasses, leaving the non-sugar soluble products in a Steffens waste water. This, by the way, is one of the wastes for which there is not now any real known treatment.

MR SAMSON: Are you talking about Steffens wastes, Mr. Jensen?

MR. JENSEN: Steffens wastes. Particularly it is highly alkaline and contains a very high loading of both organic and inorganic materials.

DR. ROGERS: Is that the kind that you use to make monosodium glutamate?

MR. JENSEN: Yes, sir.

DR. ROGERS: Maybe we ought to consume more of that in our outdoor barbecues?

MR. JENSEN: Well, I hope we can make more of it.

Then the other principal waste is flume water. Now, this is the one Mr. Croghan was talking about this morning. This is the cooling water that has been used to wash the beets. It carries a very low loading of dissolved organic material. It is the insoluble organic material he is going to screen out. The B.O.D. values are not too high in this waste. It does contain the material that is washed off the beets, the silt and the bits of leaves and tops.

The report that was made recently here in 1960 indicated there is practically no improvement in the condition of the North Platte River since 1950. When I saw that report I did about three back flips, because we have done a lot of work in here to help clean up this river, and it should have been apparent. I would like to just go through the four factories and indicate to you where we think we are today in relation to 1950.

At Scottsbluff, where we had the Steffens operation with the Steffens waste going into the stream, we had the pulp waters of all kinds. We were very close in 1950 to that 40 pounds of B.O.D. per ton of beets; we figured about 38, which is a check for all practical purposes. Today with removal of Steffens wastes, which we are now evaporating here and sending to a plant over in Colorado to reprocess to recover monosodium glutamate, potash, and a liquid cattle food, we have reduced the B.O.D. at Scottsbluff down to about 20 pounds of B.O.D. per ton of beets, or about half.

At Gering we have accomplished a great deal more. At Gering--

In addition, at Scottsbluff we have installed a continuous diffuser which has diffused our pulp water discharge.

CHAIRMAN STEIN: Are you planning any broad field spraying or irrigation at Scottsbluff?

MR. JENSEN: We have in the engineering department now the development of a plan for using the Bayard type of treatment system at Scottsbluff.

CHAIRMAN STEIN: Well, if that goes into effect, would you care to indicate what your B.O.D. loading per ton of beets would be from Scottsbluff or what you can look forward to?

MR. JENSEN: All right, now, I will have to go back here, in order to answer your question, and make a statement ahead of this so I can properly answer it.

CHAIRMAN STEIN: All right.

MR. JENSEN: There are four factories here in the valley. Three of them have pulp driers which dry the insoluble cellulose matter out of the beet and in so doing produce no waste. At Scottsbluff we are still producing wet pulp. In other words, the insoluble cellulose is put into a silo, there it drains off-- I think this is what you were thinking about today.

CHAIRMAN STEIN: Yes.

MR. JENSEN: There it drains off and produces a high strength organic waste. Now, we haven't tried a broad field application applying this type of waste to it.

CHAIRMAN STEIN: Do you contemplate a drier at Scottsbluff at all?

MR. JENSEN: We will put a drier into Scottsbluff when we can sell the products from the drier. Now, here in the valley with three driers now we have to ship the product east. We have a market for the wet pulp, because it is a very good material for starting cattle, and we try to market our pulp products with our own growers so we maintain the fertility of their land through the fertilization practices, and so on and so forth. So we hopefully want to keep all the pulp product in the valley. And as we generate enought market with the local cattle feeders, and so on, to utilize the dry pulp material, we will build a drier at Scottsbluff. It is an economic problem.

CHAIRMAN STEIN: Now, this is just for understanding. Check me if I am wrong. As I understand it, where you have a drier in the Bayard type process treatment, you can get down to, say, something below five pounds of B.O.D. per ton.

MR. JENSEN: Right.

CHAIRMAN STEIN: However, you do have a loading now of 20 pounds per ton at Scottsbluff.

MR. JENSEN: Yes.

CHAIRMAN STEIN: And the question here is that there are no immediate plans to put in a drier at Scottsbluff?

MR. JENSEN: No. That is true.

CHAIRMAN STEIN: In other words, we can expect to stay up at the 20 pound level instead of getting down to five?

MR. JENSEN: No, we will load our broad field application--

CHAIRMAN STEIN: Yes.

MR. JENSEN: --treatment system with a 20 pound per ton loading.

CHAIRMAN STEIN: Do you have any indication of what that would result in?

MR. JENSEN: I hope we can get down to 10, because we are reducing the B.O.D. by over fifty percent at Bayard. In addition, at Bayard we are having some loss of water through seepage, which adds another ten or fifteen percent to the total reduction of B.O.D. That does not return to the river. If we can have the same seepage losses at Scottsbluff that we have at Bayard and we can attain the same reduction of B.O.D., we will be below 10. We will be around nine pounds, something like that. I think there has been a sort of a standard set of eight pounds of B.O.D. per ton of beets processed.

Does that answer your question?

CHAIRMAN STEIN: That answers my question, yes.

MR. JENSEN: At Gering, which was also a Steffens house, we removed the Steffens wastes. We have installed a continuous diffuser, so there is no discharge of pulp water of any kind. We are re-using the pulp press water back in the process and we are re-using the pulp transport water for transporting pulp to the driers. And we have there a lime cake lagoon, so that we are only discharging to the river as far as organic loading is concerned flume water, and that plus what minor pollution there might be in cooling water should reduce the discharge there to around six pounds per ton of beets. We are, however, still discharging at Gering some settleable solids, and this is in the making too.

At Bayard where we have the treatment system we are well under the eight pounds of B.O.D. per ton of beets, and we are also removing all floating and settleable solids.

At Mitchell this year we are putting in a continuous diffuser, and here again we are re-using all the pulp water. That will be eliminated from discharge this year.

At Mitchell we have purchased a piece of ground to install a Bayard treatment system, but unfortunately we haven't been able to attain a right-of-way to the river from this piece of ground. You would be surprised how valuable a piece of ground can get when the Great Western Sugar Company tries to buy it, regardless of whether it is on the bottom of the river or on top of a peak. (Laughter)

In the main, in the last ten years we have, we believe, made a substantial reduction in the amount of polluting material that has been discharged to the North Platte River, and certainly we are not going to stop. On the other hand, we have nineteen plants, and we not only have to worry about Nebraska, but we have Wyoming, Montana, Colorado, Ohio, and some others to be concerned with. Of course, waste treatment systems are capital investments that require substantial amounts of money and they involve operating costs that are rather substantial, so we are trying to program these and put them in the places first where they will do the most good to the receiving stream. We have sort of a priority for them.

Certainly with the efforts here of the municipalities to clean up this area of the stream and our efforts together, I am pretty certain that within--well, I hesitate to make a prediction on years, but not too many years, we will have accomplished a substantial improvement in the quality of the water flowing down the North Platte in this reach of the stream.

CHAIRMAN STEIN: Do you have any explanation--and here again, I am as puzzled as you are, in a sense, and I am looking for an explanation--as to the conditions of the water in the stream found in that 1960 survey and talked about by Mr. Kittrell?

MR. JENSEN: I haven't at all. I don't understand it, Mr. Stein, because the effect of changing our waste treatment and re-using system should have made a rather substantial difference in this.

CHAIRMAN STEIN: Well, this is the thing that generally puzzles me sometimes. I think the proof of the pudding in the pollution business is not the installation--and I recognize that you have put in all these installations and this was what was called on--but the effect in the stream. Now, as I do understand it, and I may be wrong on this, when you put in that installation at Bayard, the Bayard type treatment-- Do you have a generic term for that?

MR. JENSEN: It has been named the broad field application.

CHAIRMAN STEIN: The broad field application. I didn't know what it was called. There were certain recommendations made by the Public Health Service, weren't there, for modification?

MR. JENSEN: Yes, sir.

CHAIRMAN STEIN: Were those followed?

MR. JENSEN: Yes, those were made.

CHAIRMAN STEIN: Those recommendations?

MR. JENSEN: Yes.

CHAIRMAN STEIN: Well, maybe we should put this is the record just to understand this. The information that we get from our sources is that these recommendations were not really followed.

MR. JENSEN: Yes, I think there was a list of some eight or ten particular recommendations made. Well, I won't say all ten of them were followed, but I wall say seven or eight, or whatever number.

CHAIRMAN STEIN: I wonder if you would mind if we ask Dr. Neel, who wrote a paper on that. I would just like to find out what the story is because this is disturbing. When an industry goes in and tries to put in a treatment facility, yet when we look at the stream we don't find a noticeable improvement, we do have a problem.

Do you want to comment on that, Dr. Neel?

DR. NEEL: We made two studies of the Bayard broad field disposal area, one in 1953, which you have there, Mr. Jensen, and another in 1955. The 1953 study showed that the flume at the head of the field was improperly made--

MR. JENSEN: Yes.

DR. NEEL: --and there were bypasses and shortcircuiting all over. Well, by 1955 the industry had installed a very fine welded steel flume and with distributor flumes. We had pipes out of a wooden flume in 1953 which were always clogging up, and they put in short flumes attached to this metal flume, which improved the distribution across the upper end of this broad field disposal area.

We made recommendations that the field be leveled so that there was a uniform path of flow and no areas of the field be short-circuited or exempt from this flow, or that the thing be lagooned so that detention would be greater. There were three lagoons installed in 1955. The bottoms were not leveled off for those and some of them held water only in one little corner, and so forth. I don't know whether those lagoons are still in effect or not.

MR. JENSEN: The following year we put metal checks across each of the lagoons, three of them in each lagoon, to hold about a four- or five-inch level of water in each section of each lagoon, so to speak, so that we could keep the whole area covered and so that the oxidation would be improved.

DR. NEEL: Well, those have not been made. The main recommendation we made regarding the leveling of the field to get a uniform flow across it or better retention by the lagoons had not been made at our last study.

MR. JENSEN: No, not at your last study, but I think you made some recommendations in your 1955 study in your conclusions there.

DR. NEEL: I might say for Mr. Kittrell here that our studies in 1955 showed that there were only 3.36 pounds of B.O.D. discharged per ton of beets processed.

MR. JENSEN: That is right. If you consider the loss of water across the whole field, that is right.

DR. NEEL: That is right, we considered the loss. Solids were removed. We got better than ninety-nine percent removal of solids, removal of lime, and all those things that we found so objectionable from the plant.

MR. JENSEN: As I recall, nearly all the suspended solids were removed in the upper twenty-five percent of the field.

DR. NEEL: In 1955 we reiterated our recommendation that the field be smoothed so that there would be uniform discharge all over it or that it be better lagooned.

CHAIRMAN STEIN: That is the one area, possibly, then, of difference, that these fields have not been smoothed. Now, do you think that that is substantial or wouldn't make much of a difference?

MR. JENSEN: I tell you why we didn't do it, because you can't make it work. We had an experimental field that is just as flat as a billiard table. You can't spread water over it uniformly no matter how hard you try if there are settleable solids in the water, because it will deposit and it will run this direction and deposits more and back. That is why we elected to put a check--what was it, Harold, five or six inches high?

MR. BURK: We leveled them. In some places it was five or six, in some places it was only one or two. We only put that in the the center lagoon, though.

DR. NEEL: That was put only in the center lagoon?

MR. JENSEN: Yes.

DR. NEEL: We anticipated that with this spreading of the waste there would be baffle points to level out the flow.

MR. JENSEN: Yes, that is what it was, yes.

DR. NEEL: From time to time.

MR. JENSEN: Now, you can correct me if I am wrong, too, because I am not certain that I am too familiar with one other change. They are now not utilizing each long longitudinal section. They are moving from one to the other, because they are getting a big improvement in the seepage loss. I think during the first thirty days there is practically no water runs out of that system now.

DR. NEEL: That is interesting to note how the seepage has improved there with the application of lime to that ground.

MR. JENSEN: And Mr. Williamson, you were talking about algae. We had substantial algae growth in that pond, I think because it was shallow enough that it will support that type of growth.

CHAIRMAN STEIN: Thank you. Did you want to go on?

MR. JENSEN: No. I think that concludes my statement.

MR. CHRISTENSEN: Mr. Chairman, may I direct one question to Mr. Jensen?

What, if any, was the differential in production between 1950 and 1960? I mean in the number of tons of beets produced.

MR. JENSEN: During that course of time we had a few years when we had less beets than we had in 1950. However, that last--what, Harold?--three we have had higher production in the North Platte Valley in tons of beets than we had in 1950.

MR. CHRISTENSEN: That would, then--

CHAIRMAN STEIN: Do you think this could have an effect on the loading of the stream?

MR. JENSEN: It shouldn't, because we are accomplishing most of this by running more days. We used to run 75 or 80. Last year we ran over 100 in all these plants.

CHAIRMAN STEIN: You see, this is the problem that I always have with this eight pounds of B.O.D. per ton of beets. If you run two tons, you might be fine. Then when you increase your production to 2,000 tons and you still get eight pounds per ton of beets, you have a pretty big load.

MR. CHRISTENSEN: Yes.

MR. JENSEN: Our daily capacity has gone up some, I will be frank to admit that, because if you don't improve your operation every year you don't stay in business in this game.

CHAIRMAN STEIN: That is right.

MR. CLARE: I think I have a question now. There was reference to the percolation from the Bayard broad field application system and its improvement, probably because of the presence of calcium in the wastes.

MR. JENSEN: It is a high quantity of calcium.

MR. CLARE: I think in one of your other statements you indicated that it is the pulp silo drainage at Scottsbluff that you may want to apply to a broad field irrigation?

MR. JENSEN: We will apply that along with our other wastes.

MR. CLARE: Will it have calcium also?

MR. JENSEN: No, it will not. It is dissolved organic material.

MR. CLARE: Then you may not have the good percolation rate?

MR. JENSEN: No, but we will have calcium material with it.

MR. CLARE: I see.

MR. JENSEN: From the lime cake.

DR. NEEL: The total waste from the plant will have calcium.

MR. JENSEN: Yes, the total waste from the plant will have calcium.

MR. CLARE: And this is at Scottsbluff where you will apply this broad field application?

MR. JENSEN: Yes. We hope, if everything goes according to schedule, to have this in operation by next fall.

MR. CLARE: That is a year from now?

MR. JENSEN: Yes. These installations depend again on your ability to find a piece of land that is relatively flat and comprises an area of 200 acres.

MR. CLARE: Right.

MR. JENSEN: That isn't always available, either.

CHAIRMAN STEIN: I don't want this to be construed as a loaded question, and you don't have to answer it, but would you construe a drier to be a treatment device of some sort if it can effectuate reduction of wastes from about 10 pounds a ton B.O.D. to less than five?

MR. JENSEN: Certainly. We consider pulp driers as an effective means of reducing our waste problem.

CHAIRMAN STEIN: Well, okay. Then the next question is, why isn't that a waste treatment method which might be considered at Scottsbluff--and again, I don't want to probe at this time--not in terms of a money-making proposition, but in terms of a combination or a waste reduction proposition?

MR. JENSEN: The only way I can answer that is, it is a very good likelihood that th's might cost you more if you couldn't sell the product than treating it in some other manner.

CHAIRMAN STEIN: Well, isn't there an alternative matter of achieving that reduction at, say for example, Scottsbluff not having the drier and getting it down to less than five?

MR. JENSEN: We will tell this after we have tried this on our broad field. I don't have any idea how well this will work, but most of the organic wastes from a sugar factory are assimilated quite easily. I suppose because of the presence of sugar, Mr. Kittrell?

MR. KITTRELL: Yes.

MR. JENSEN: The stream can recover quite fast from it and maybe a treatment system will do the same thing, particularly if we have enough alkalinity in there to offset the acidity of this pulp drainage. We have an experimental project going on in Windsor, Colorado, right now where we have a lime retention pond that we have discontinued using that has 10 or 12 feet of lime in it, and we are going to apply pulp silo drainage on this, nothing else, to see what the effluent will be like when it comes out of this pond, and, of course, it will dissolve some of this mineral material.

CHAIRMAN STEIN: Thank you very much, Mr. Jensen.

DR. SAMPSON: I would like to ask two questions, because I may have to leave you.

CHAIRMAN STEIN: All right.

DR. SAMPSON: I think to place the position of Wyoming in its proper perspective in this thing that we have two questions we should ask. Dr. Rogers has really already answered one of them. The question that I feel is pertinent for us to ask is what is the quality of water that Nebraska requires as it crosses the state line from Wyoming in the Platte River, and he has indicated that you use the Missouri Basin Standards, which we also use as one of the Missouri Basin drainage states.

I would also like to ask you, Dr. Rogers, does Nebraska require any different treatment of the discharged used water from a sugar factory in Nebraska than we require in Wyoming? You heard our testimony this morning as to what we require. In other words, are you requiring your sugar factories to do something more to your water in Nebraska than you want us to do in Wyoming, than we are doing in Wyoming?

DR. ROGERS: I prefer to defer to the Chairman of the Water Pollution Control Council, if he understands your question. I am not sure that I do.

MR. SAMSON: I was afraid that was coming.

DR. SAMPSON: You asked me to ask you.

MR. SAMSON: That question is a little difficult to answer. We are using the standards that Dr. Rogers has alluded to in his statement, and right at the present time I have a committee working that is going into the water quality standards and all the various ramifications. That committee has been functioning for the last six months working on water quality. So I mean there may be some change in our position from what Dr. Rogers has talked about.

DR. ROGERS: I think I might add one further word of explanation.

So far the Water Pollution Control Council of Nebraska has not found it necessary to issue any orders, and, therefore, we have not had to arrive at any other than these broad general objectives for water quality standards that are stated in the Missouri Basin Engineering Health Council Report.

CHAIRMAN STEIN: I might say, I think in the public health activities we have gone along in this area of the country with those ten state recommendations. As I understand them, and I may be wrong, that it calls for five milligrams per liter on a B.O.D. basis on a five day twenty degree, is that right?

MR. SAMSON: I believe that is right.

MR. WILLIAMSON: No, the only recommendation on them as far as B.O.D. goes is that water used for drinking purposes has to have twenty-five percent B.O.D. satisfaction. And the only thing they throw in there is five parts for D.O. to sustain fish life.

CHAIRMAN STEIN: Well, I think we have a question here with a sustaining fish life. The states generally have that. I think--

MR. WILLIAMSON: There is a copy of it.

CHAIRMAN STEIN: Yes. I think that the question of maintaining fish life might very well require something of that, and if the water were of that quality at the state line, I don't think we would have the fish and game man from Nebraska and Wyoming, and Dr. Neel would not complain about that. And then there is a question of the coliforms. If this is what we are coming toward, this may be an objective that we can stand up to and see where the treatment is going to lead us, and we may have to reappraise this in the light of those factors. Standards are a funny thing. At least we can make an assumption, it seems to me.

I am just saying this at this point before you leave, that if the B.O.D. in the stream goes above five, then we have to begin looking at that as an indicator to see what that does to fish and other life. If the coliforms go above 5,000, that has to be looked at. Now, maybe those coliforms can be sorted out. A lot of them are coming from sugar beets that are not fecal in origin or from a warm blooded animal, and that can be done. But I don't know that, on the basis of the present information, in the light of the indicators in the stream being higher than that, we can rest very easily. We have to have some more precision.

DR. SAMPSON: Well, thank you.

MR. SAMSON: Before you leave, Doctor, I think somebody from Mr. Mel Steen's office was here. They may want to say something. Do you mind?

DR. SAMPSON: I am not going to run right off.

MR. AGEE: My name is Agee, from the Nebraska Game Commission.

I am sorry that I didn't come out here with a prepared statement. Neither did I come out here with any specific instructions from Mr. Steen, whom I represent here. However, I am sure he would concur in my making a few comments on the matter of fish and game in this section of the river. It has already been commented upon for that section which lies west of the state line, and Dr. Neel has described the technical aspects of it quite well. I don't have at hand any further information to supply there.

However, I think it is of some interest to note that in this section of river, and continuing on down to the head of Lake McConaughy, there was a very important historic value here for both fish and wildlife, of particular interest being waterfowl, and the waterfowl still persist in their importance. The fish, however, do not persist. We do know that for a short portion of the year, during spring and early summer, we do have migration movements up out of Lake McConaughy and into some of these streams which enter the North Platte River. Those streams continue to hold fish through the summer and fall, but they do not persist in the river itself. If this stream were to be restored so far as a trout fishery were concerned or a sauger fishery, or one of several other potential species, we could consider it to be of considerable importance, and I would mention specifically trout. A recent survey that we completed showed that in the State of Nebraska our total trout-producing stream mileage amounts to only about 400 miles in the entire state, so you can see that the addition of a segment of river here totaling, I suppose, some 50 or 60 miles, carrying a good volume of water, would certainly be worthwhile as far as we are concerned, and I am sure that our department will lend whatever support it can to further this cause.

CHAIRMAN STEIN: Thank you, Mr. Agee.

Are there any comments or questions?

If not, may we take a recess for ten minutes. Then we will try to have a short discussion, see if we can come to some conclusions and summarize.

A ten-minute recess.

(RECESS)

CHAIRMAN STEIN: Now we will stand reconvened and try to have a discussion and summarize. There are various ways we can do this. I think there are many substantial areas that we can agree on pretty readily and combine in both the discussion and the summary and we can proceed with the evidence.

Do any of the states want to summarize first? Do you want to do that?

MR. WILLIAMSON: Well, I think it might be well to make a small statement here to clarify why we have gone the direction we have in requesting certain treatment in view of the standards, the ten-state standards which are common to both states. I think maybe this might clarify a point or two in somebody's mind.

Basically those ten state standards cover physical, chemical, and bacteriological quantities in the thing. As you will notice, the treatment which we have requested at this plant has been based mainly on the physical characterisitics of the waste. In other words, we have attempted to obtain maximum removal of the gross solids, the beet pulp solids and this type of thing, plus some removal which we can't determine yet of silt or turbidity. In other words, as far as this stream goes for additional use as a fishery, if we can clear the stream up, then we can maintain a biological chain in there which will support fish.

We are saying that the soluble chemicals are not producing a toxic effect. The B.O.D. is not sufficient in our stretch of the river to deplete oxygen below five parts per million, which is the standard. In other words, we are always above this standard and this would maintain fish life, so actually our problem has been to develop clear water so we can sustain a biological life cycle or chain. So we have attacked the treatment from that aspect rather than an over-all inclusive of B.O.D. This might clarify a little bit some of the reason we have gone the way we have.

CHAIRMAN STEIN: Do you have any comments you want to make, Doctor?

DR. ROGERS: Yes. I think I will take my cue from a remark that the former Nebraskan, Dr. Sampson, made to me during the lunch hour. He said this conference reminded him of the two prostitutes in the parlor who were arguing which was the more virtuous. (Laughter)

CHAIRMAN STEIN: You see, if we had literary or poetic summaries, we could just stop here and go home. (Laughter)

DR. ROGERS: If you will just think about that for a minute, after you have stopped enjoying it, you will see that there is more truth than literary license in that particular statement, because certainly there is no one who is all good or all bad and this is true of states. We haven't done as much good as we can to this stream, and certainly we are not all bad, because no matter how badly we have polluted it, it could still be worse, I guess, than it is right at the present time.

I think the other aspect of the situation that the story reminded me of, too, was that no matter how bad you get, you are still capable of salvation, even these ladies of easy virture. So let's take our cue from that and let's try to go on from here and make even more and better improvements to the quality of the water that we are talking about here.

Somebody else earlier made the remark that this was something like the pot calling the kettle black. Well, instead of trying to argue which one is the blacker, let's get some scouring powder out and start cleaning up both the pot and the kettle.

I think that is enough poetic license for now.

CHAIRMAN STEIN: Thank you, Doctor.

DR. SAMPSON: Mr. Stein, I would like to make my position clear. I am reminded of the little boy that went to the movie and he sat through it four times because this was a wild west show, and every so often the hero would grab the heroine and he would shake her and he would say, "I want what I want when I want it."

So this kid watched this and finally after he decided he had had enough, he got in his own neighborhood and he met one of his little neighbors, a little girl who was about his age. He grabbed her by the shoulders and he shook her and he said, "I want what I want when I want it."

And she said, "You will get what I have got when I get it." (Laughter)

I think that maybe we can say that that is what will happen here too.

CHAIRMAN STEIN: I will do like the Federal bureaucrat does, I won't even attempt to top either one of those.

I think we can pretty much agree that the North Platte River is an interstate stream within the meaning of the Federal Act since it crosses the border of two states, Wyoming and Nebraska. I think we can also agree that the North Platte River, due to discharges of industrial and municipal wastes, has been polluted so as to interfere with fish and aquatic life. It has destroyed the aesthetic value of the river, and I would like to footnote here, I think one of the most important things that we forget about a body of water is the passive enjoyment people get from such streams. I think a lot of the American people just like to get out and get near and look at a clean body of water. Out here in the west I don't think some of you people realize the attractiveness of that, but to a fellow like myself, who spent most of his life in the industrial east, one of the most thrilling things out here is to get on one of your clear Wyoming and Nebraska streams and just watch the water, do nothing else but look at it. That is worth the price of the trip, even though Uncle Sam generally pays for mine.

It also has interfered with the recreational uses of the river, which could be swimming, boating, and fishing, and it has also interfered with the river as a--and I want to emphasize this word--potential source of municipal and industrial water supply.

Now, from there on I think we can agree on the other point, that is if we can expect Wyoming to provide a water of a satisfactory quality as it crosses the state line, we have to expect that Nebraska will undertake an active campaign within its own state to maintain adequate conditions in the river. This means in Nebraska a municipal and industrial waste treatment works. In Nebraska flowing into the North Platte now, as I understand it, there are not only inadequately treated industrial wastes, as we heard from the sugar beet industry, but also municipal wastes and packing house wastes. As I understand it, just within the past week or so Scottsbluff has received an offer from the Public Health Service under the Federal Water Pollution Control Act of a grant of $250,000 for municipal sewage treatment works. This is a good sign. But I think unless the State of Nebraska proceeds with an effective program on its side of the river, we would not be in too good a position in asking Wyoming to deliver a clean water to that state line, and I think this is one of the underlying factors which we can all agree on.

To get back to the Federal aspects of this, we can only deal with pollution which originates in one state and endangers health or welfare of persons in another. I think in this case it is largely the sugar beet mill at Torrington which is subject to the Federal jurisdiction. The Torrington municipal sewage treatment facility seems to be working perfectly satisfactorily and certainly causing no interstate effect.

We have heard of, and do take cognizance of, the progress made by the sugar beet industry up and down the valley, particularly installations of the Great Western Sugar Company, which have employed a variety of means, and also of the Holly Sugar Company, which steadily has been installing waste treatment facilities. However, we must recognize that the ultimate protection that we have to provide in waste treatment or what we are driving for is not a question of installation or reduction in terms of B.O.D. per ton of beets, but what does this do to the river. In other words, what can we use the river for after treatment that we couldn't use it for before.

We do have one of the best streams in the country in the North Platte River as it hits Torrington. Anything less than that, I think the people here agree, anything materially less than that you have to regard as a degradation of the stream.

I think we have to agree that the industries and the municipalities here, too, have to provide a type of treatment which will permit the full use of the river as a sport fishery and permit the full recreational use of the river and which will, incidentally, if that is provided for, I think, also make available to the people of this area a potential source of municipal and industrial water supply. As has been indicated, this water, particularly for some industries, might be attractive, since it is of a softer quality, it could be of a softer quality, than many of the ground water sources in this area.

We have heard the programs of these sugar beet industries and some of the other industries, at least for the coming campaign. I don't know that we have heard quite enough about the program in Nebraska of the other municipalities and the other industries. I think we possibly can take as an indication point that we might consider that a possible objective of getting water--And I don't think that we can talk about the state line here.--We have to talk about water after it is mixed below Torrington, because these fish move up and down, and if the water is polluted three miles or four miles above the state line, that is still going to affect both states, because the fish don't recognize where their boundary is. We should be looking for water, it seems to me, that would provide no more than five milligrams per liter in B.O.D. on that five-day averages measured at twenty degrees C. as Mr. Kittrell pointed out, and to start we should begin looking for a coliform count of 5,000 or less.

I do think a considerable amount of work has to be done, possibly, in both of these areas. The Public Health Service, I think, stands ready with the states, in cooperation with the states, to make available bacteriologists, engineers, chemists, and other personnel to determine what is happening in the river here during this sugar beet campaign, to determine whether there is an interference with the fishery, and the biologists will look at that to determine if we can come up with more precise standards on bacteriological contamination other than that 5,000 coliform.

MR. SAMSON: Mr. Stein, may I interrupt you here for a moment?

CHAIRMAN STEIN: Yes.

MR. SAMSON: You talk about those 5,000 coliform. Are you differentiating between fecal coliforms and other types of coliforms?

CHAIRMAN STEIN: I am glad you mentioned that, Mr. Samson. At the present time, on the basis of the report--Mr. Kittrell, you correct me if I am wrong--I don't know that we can make a distinction right at this point. One, we don't know what percentage of these are fecal coliform or coliform from warm blooded animals, we don't know what pathogens are in the water or what may be relatively harmless coliform not indicating pollution harmful to health, but I think once we get coliform counts above 5,000--and again let me bring out Mr. Kittrell's point that the discharge of sugar-laden wastes might provide a perfect culture medium for the increase of fecal coliform and pathogens, they may or may not.

What I am proposing is at least for the first year we start with something, we see where we come on these coliform counts, try to send out our bacteriologists to see if they can determine precisely what kinds of coliform they can distinguish in here and whether we can come up with a more precise measurement. Now, 5,000 gross coliform may not mean anything.

Again we are getting off this summary, but let me put it this way. Generally in the radiation field, I think we have an analogy in that, for example we take a beta count and if the beta count is way high it may not mean very much, but if you have some radium floating around and you take a beta count and you have a beta count, brother, you had better watch out. Now, this is the kind, I think, of distinction we have to make, it seems to me, where we are dealing with an organic waste of this type to see if we can come up with something more precise. In the absence of that, I think that we can just go with the standard measurements we have and view any coliform count above 5,000 with suspicion.

Again I think we have to examine these B.O.D.'s and not necessarily dissolved oxygen in a stream of this kind. The key point, again, is what is happening in the stream. The biologists will go out and examine the fish species, the bottom life, the biota, and the algae. I think the residents of this area can walk down to that stream and ride across it and smell it, and I don't think they will have to be any kind of a real experienced scientist to get an indication of the kind of industrial pollution you get from sugar beet mills. Your nose and your eyes sometimes are the best answer.

These are the things we are going to keep looking for. Now, I would suggest we do that in cooperation with the rest of the states.

If it is determined that conditions are not satisfactory in the stream during this beet campaign, either the states do this or we will reconvene the conference and determine what has to be done. I think the indications of the answer to this are relatively clear. I think the organic loadings have to be handled, and ideally what we have to strive for is real lowered organic loadings, no silt discharged to the stream, no lime slurry discharged to the stream, no cossettes discharged to the stream, no beet particles or tops discharged to the stream. And again I am specifying the sugar beet industry--as

Mr. Jensen said, this might be your day--but we have pretty good standards, I think, for treating packing house wastes and municipal wastes, and the only reason they are not mentioned is because I think the standards are there and the accepted methods of treatment are well known. We are assuming that.

I think the point may come, the indications point to this here, where if conditions are not satisfactory there may have to be consideration to going to broad field application in all installations as a minimum or its equivalent. Now again, for a regulatory agency, you can't specify one type of treatment, but this broad field application has proved effective in keeping these out, and this is what may be coming.

I suggest that the Public Health Service is under an obligation to find out what happens here, and we will make our information available to the states and to other interested parties. The advantage of this is making full information available to all concerned. And I am suggesting, since we can't get any definitive notion of a cleanup or an assured cleanup of the river at this time, let us plan during this campaign to determine what happens to sharpen up our criteria after the study. Then if necessary, we should reconvene the conference and determine in conjunction with local industry, the cities and the states what further has to be done. Hopefully, if what is done during this campaign can meet thse criteria or we can improve on it, this will be fine.

Is that agreeable?

DR. SAMPSON: Sounds all right.

MR. SAMSON: That sounds very reasonable to me.

DR. ROGERS: It is agreeable with me.

CHAIRMAN STEIN: Are there any other comments from the group?

MR. SAMSON: Someone made the suggestion to me that possibly dissolved oxygen would be a better way to operate than this five milligrams per liter of B.O.D. Do you have any thinking about that?

CHAIRMAN STEIN: Mr. Kittrell covered that in his report.

MR. SAMSON: Is it easier to handle a test on the dissolved oxygen than the B.O.D., Mr. Kittrell? And I think that the laboratory facilities are much more extensive on a B.O.D. than on a dissolved oxygen test?

MR. KITTRELL: Well, it is not altogether a matter of how difficult or how easy it may be to determine this. It is a matter in this case, I think, that this stream has such a tremendous capacity for accepting organic matter without stream oxygen depletion that I feel that if we went on a five parts per million D.O. standard only, that we still would have a stream very heavily loaded with organic waste which would be damaging in other respects.

MR. SAMSON: Very well. You have answered my question. Thank you.

CHAIRMAN STEIN: I think that was the comment in his report.

I would like to indicate that we may come up after our bacteriologists are here with some other criteria. The B.O.D., dissolved oxygen, coliforms, as you know, are just indicators of pollution and tools to be used. I think Mr. Kittrell has had as much experience in stream surveys as any many I know in this country, and he has found through the years that in a rapidly-moving stream such as we have here that dissolved oxygen is not a very good indicator of pollution. The question is there is no point getting dissolved oxygen below five before your fish are going to be dead. You have met the standard, but you have killed the fish.

The purpose here is to restore this stream so you are going to have a fishery and be able to use it for recreation, and the purpose also is to find an indicator that a scientist or a technician can use by taking a measurement or going into a laboratory which will indicate a stream condition which will be critical to these uses. Now, as Mr. Kittrell points out, he doesn't think that in this case dissolved oxygen would be such an indicator.

DR. SAMPSON: May I ask one question for clarification with regard to the reports?

It is my understanding that the summaries will be mailed to the state agency involved, and from that state agency those interested parties obtain their reports, is that correct?

CHAIRMAN STEIN: That is correct.

Now, there is just one more point. We, or I would suspect that the people from the Public Health Service also, will be in touch with the state agencies to indicate what we are going to do on the survey, and in line with our usual practice our plan of operation will be fully discussed with you, and as much cooperation as we can get from you will be welcome. I do not think that this will be a joint survey. I don't think that we will be going in and making any tests or using any procedures where we haven't reached complete agreement with the state. And if the states wish it, we would be very happy to have consultation from the industry and cooperation from the industry on the methodology and what we are going to do and how this is going to be set up and interpreted, and make this all available. I think that probably would be the best way to work.

MR. SAMSON: Mr Chairman, I have a motion to make. Before I make the motion I would like to respectfully inquire of Dr. Sampson or tell Dr. Sampson we would love to be your host at some later date and extend an open invitation to Wyoming to return to Scottsbluff for another meeting.

With those remarks, I move that we adjourn.

DR. SAMPSON: This reminds me so much of some of the weddings I have heard about where the father-in-law has a shotgun. (Laughter)

Thank you for your invitation.

CHAIRMAN STEIN: Well, the indication there, it is generally the father of the girl who has the shotgun, but if you are in the position of the young fellow, you must have had a lot of fun. (Laughter)

Thank you all for coming. We stand adjourned.

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REPORTER'S CERTIFICATE

I, Virginia Hough Rankin, do hereby certify that I was present at the time and place first hereinbefore set forth, the aforementioned parties appearing, that I took down in shorthand the entire proceedings had at said time and place, afterwards transcribed said shorthand notes, and that the foregoing 200 pages constitute a true, correct, and complete transcript of my said shorthand notes.

Virginia Hough Rankin
Shorthand Reporter

6005 East 93rd Street
Kansas City, Missouri

ATTENDANCE ROSTER

CONFERENCE ON INTERSTATE POLLUTION
Scottsbluff, Nebraska

September 12, 1961

Agee, C. Phillip	Nebraska Game & Parks Commission Lincoln, Nebraska
Applegate, L. S.	City Superintendent Torrington, Wyoming
Bauer, Martin A.	U. S Public Health Service Region VIII, Denver, Colorado
Bennett, Joseph H.	Corps of Engineers Omaha, Nebraska
Bosley, Clifford E.	Wyoming Game & Fish Department Lander, Wyoming
Bronen, Dr. W. O.	Rotary Club Scottsbluff, Nebraska
Burk, H. D.	Nebraska Water Pollution Control Council & Great Western Sugar Company Scottsbluff, Nebraska
Burwell, Earle S.	Member, Wyoming Stream Pollution Control Advisory Council Casper, Wyoming
Carpenter, Terry J.	Town of Terrytown Terrytown, Nebraska
Christensen, Don	Star Herald Scottsbluff, Nebraska
Christensen, S. A.	Member, Wyoming Stream Pollution Control Advisory Council
Culbertson, Don M.	U. S. Geological Survey Lincoln, Nebraska
Croghan, I. D.	Plant Superintendent Holly Sugar Corporation Torrington, Wyoming
Engendorff, O. Henry	Wyoming Department of Agriculture Cheyenne, Wyoming

Engstrom, Harold E.	Soil Conservation Service Lincoln, Nebraska
Fitzpatrick, Joseph W.	U. S. Public Health Service Region VIII, Denver, Colorado
George, W. L.	Mayor City of Bayard Bayard, Nebraska
Gibson, W. A	City Council City of Torrington Torrington, Wyoming
Gilbert, R. L.	Star Herald (council) Morrill, Nebraska
Hall, Lee	Radio Station KOLT Scottsbluff, Nebraska
Jensen, Lloyd T.	Great Western Sugar Company Denver, Colorado
Kittrell, F. W.	U. S. Public Health Service Cincinnati, Ohio
Klietsch, Fred	Nebraska Department of Water Resources Bridgeport, Nebraska
Konselman, Albert S.	Bureau of Mines, Region III Denver, Colorado
Leikvold, Carsten D.	City Manager City of Scottsbluff Scottsbluff, Nebraska
Long, Frank E.	Chairman, Wyoming Stream Pollution Control Advisory Council Buffalo, Wyoming
Moore, B. W.	City of Bayard Bayard, Nebraska
Murphy, Frank	Wyoming State Engineer's Office Torrington, Wyoming
Myers, George R.	Member, Nebraska Department of Health Gering, Nebraska
Nasi, Kaarlo W.	U. S. Public Health Service Region VIII Denver, Colorado

Neel, Joe K.	U. S. Public Health Service Region VI Kansas City, Missouri
Nichol, William E.	Mayor City of Scottsbluff Scottsbluff, Nebraska
Ogilvie, J. L.	Bureau of Reclamation Region VII Denver, Colorado
Peterson, Liven A., Jr.	U. S. Bureau of Sport Fisheries & Wildlife Grand Island, Nebraska
Pringle, J. R.	Farmers Irrigation District
Rogers, Dr. E. A.	Director Nebraska Department of Health Lincoln, Nebraska
Sampson, Dr. James W.	Director Wyoming Department of Public Health
Samson, John S.	Chairman Nebraska Water Pollution Control Council Omaha, Nebraska
Schmidt, Eugene L.	U. S. Bureau of Land Management Cheyenne, Wyoming
Sensintaffer, R. M.	Bureau of Reclamation Casper, Wyoming
Sidio, A. D.	U. S. Public Health Service Cincinnati, Ohio
Stelk, Roger	City of Bayard Bayard, Nebraska
Stewart, Keith	City of Morrill Morrill, Nebraska
Thomas, R. E.	Nebraska Game & Parks Commission North Platte, Nebraska
Townley, Donald A.	U. S. Public Health Service Region VI Kansas City, Missouri
Vanderhoof, T. H.	West Nebraska Branch Laboratory Nebraska Department of Health Scottsbluff, Nebraska

Wallace, Neal P.	Star-Herald (council) Scottsbluff, Nebraska
Wiberg, Oscar	Scotts Bluff County Health Department Gering, Nebraska
Williamson, A. E.	State Sanitary Engineer Wyoming Department of Public Health Cheyenne, Wyoming
William, K. F.	City of Bayard Bayard, Nebraska
Witschy, Roy	Nature Club Scottsbluff, Nebraska
Hunsinger, Richard G.	U. S. Public Health Service Region VI Kansas City, Missouri

APPENDIX

SUMMARY OF CONFERENCE

(FIRST SESSION)

POLLUTION OF INTERSTATE WATERS

# of the

NORTH PLATTE RIVER

(WYOMING - NEBRASKA)

The North Platte River rises in Jackson County in Colorado from whence it flows northerly into the State of Wyoming. It then follows the pattern of a large loop, flowing through southeastern Wyoming, northerly, easterly, and southeasterly, and crosses the Wyoming State line near Torrington, Wyoming, into Scotts Bluff County, Nebraska. It courses through the southerly part of the State of Nebraska until it is joined by the South Platte River in Lincoln County, Nebraska. As the Platte River, it continues easterly across Nebraska to its confluence with the Missouri River below Omaha, Nebraska. The North Platte River Basin embraces an area of approximately 32,000 square miles, extending from north central Colorado to southeastern Wyoming and western Nebraska, and the river's waters are used for a number of beneficial purposes including irrigation, industrial application, municipal water supply, fishing, boating and other recreational uses.

In accordance with the written request dated July 21, 1961, of Dr. E. A. Rogers, Director of Health, Nebraska Department of Public Health, acting on behalf of the Nebraska State Water Pollution Control Council, the Surgeon General called a conference in the matter of the pollution of the interstate waters of the North Platte River and its tributaries in Nebraska and Wyoming, under the provisions of section 8 of the Federal Water Pollution Control Act (33 U.S.C. 466, et seq.). The Federal Act requires the Surgeon General to call a conference when requested by a State water pollution control agency. The first session of the conference was held on September 12, 1961, at the City Hall, Scottsbluff, Nebraska.

The following conferees representing the State water pollution control agencies of Wyoming and Nebraska, and the Public Health Service, attended the first session of the conference:

E. A. Rogers, M.D.	Nebraska Department of Health
John S. Samson	Nebraska Water Pollution Control Council
James W. Sampson, M.D.	Wyoming Department of Public Health
Arthur E. Williamson	Wyoming Department of Public Health
Herbert C. Clare	U. S. Public Health Service Kansas City, Missouri
Murray Stein, Chairman	U. S. Public Health Service Washington, D. C.

Also participating in the first session of the conference were the following:

C. Phillip Agee	Nebraska Game & Parks Commission Lincoln, Nebraska
L. S. Applegate	City Superintendent Torrington, Wyoming
Martin A. Bauer	U. S. Public Health Service Denver, Colorado
Joseph H. Bennett	Corps of Engineers, Omaha District Omaha, Nebraska
Clifford E. Bosley	Wyoming Game & Fish Department Lander, Wyoming
W. O. Bronen, M.D.	Rotary Club Scottsbluff, Nebraska
H. D. Burk	Nebraska Water Pollution Control Council & Great Western Sugar Company Scottsbluff, Nebraska

Earle S. Burwell	Wyoming Water Pollution Council Casper, Wyoming
Terry J. Carpenter	Town of Terrytown Terrytown, Nebraska
Don Christensen	Star-Herald Scottsbluff, Nebraska
S. A. Christensen	Wyoming Water Pollution Council
Don M. Culbertson	U. S. Geological Survey Lincoln, Nebraska
I. D. Croghan	Plant Superintendent, Holly Sugar Corporation, Torrington, Wyoming
O. Henry Engendorff	Wyoming Department of Agriculture Cheyenne, Wyoming
Harold E. Engstrom	Soil Conservation Service Lincoln, Nebraska
Joseph W. Fitzpatrick	U. S. Public Health Service Denver, Colorado
W. L. George	City of Bayard Bayard, Nebraska
W. A. Gibson	City Council, City of Torrington Torrington, Wyoming
R. L. Gilbert	Star-Herald Morrill, Nebraska
Lee Hall	Radio Station KOLT Scottsbluff, Nebraska
Lloyd T. Jensen	Great Western Sugar Company Denver, Colorado
F. W. Kittrell	U. S. Public Health Service Cincinnati, Ohio
Fred Klietsch	Nebraska Department of Water Resources Bridgeport, Nebraska
Albert S. Konselman	Bureau of Mines, Denver Federal Center Denver, Colorado
Carsten D. Leikvold	City Manager, City of Scottsbluff Scottsbluff, Nebraska

Frank E. Long	Wyoming Water Pollution Council Buffalo, Wyoming
B. W. Moore	City of Bayard Bayard, Nebraska
Frank Murphy	Wyoming State Engineers Office Torrington, Wyoming
George R. Myers	Member, Nebraska Department of Health Gering, Nebraska
Kaarlo W. Nasi	U. S. Public Health Service Denver, Colorado
Joe K. Neel	U. S. Public Health Service Kansas City, Missouri
William E. Nichol	Mayor, City of Scottsbluff Scottsbluff, Nebraska
J. L. Ogilvie	Bureau of Reclamation Denver, Colorado
Liven A. Peterson, Jr.	U. S. Bureau of Sport Fisheries & Wildlife Grand Island, Nebraska
J. R. Pringle	Farmers Irrigation District
Eugene L. Schmidt	U. S. Bureau of Land Management Cheyenne, Wyoming
R. M. Sensintaffar	U. S. Bureau of Reclamation Casper, Wyoming
A. D. Sidio	U. S. Public Health Service Cincinnati, Ohio
Roger Stelk	City of Bayard Bayard, Nebraska
Keith Stewart	City of Morrill Morrill, Nebraska
R. E. Thomas	Nebraska Game & Parks Commission North Platte, Nebraska
T. H. Vanderhoof	West Nebraska Branch Laboratory Nebraska Department of Health Scottsbluff, Nebraska
Neal P. Wallace	Star-Herald Scottsbluff, Nebraska

Oscar Wiberg	Scottsbluff County Health Department Gering, Nebraska
K. F. William	City of Bayard Bayard, Nebraska
Roy Witschy	Nature Club Scottsbluff, Nebraska

The Chairman of the Conference pointed out that:

1. Under the Federal Water Pollution Control Act pollution of interstate waters which endangers the health or welfare of persons in a State other than that in which the discharges originate is subject to abatement under procedures described in section 8 of that Federal Act.
2. The first step of this procedure is the calling of a conference.
3. The purpose of the conference is to bring the States and the Public Health Service together to lay a basis for future action by all parties concerned and to give the States and localities an opportunity to take remedial action which may be indicated under State and local law.

In the light of the conference discussions, the conferees unanimously agreed to the following conclusions and recommendations:

1. That the North Platte River below Torrington, Wyoming, is an interstate stream within the meaning of the Federal Water Pollution Control Act.
2. That pollution of interstate waters subject to abatement under the Federal Water Pollution Control Act is occurring in this stretch of the North Platte River.
3. That the river above Torrington is a relatively clean stream.
4. That discharges of industrial wastes from a plant in Torrington, Wyoming, sewage from Lyman, Morrill, Scottsbluff,* Gering, Minitare, Melbeta, Bayard, and Bridgeport, Nebraska, and industrial wastes

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*Terrytown was inadvertently omitted from the Summary as distributed to the Conferees.

from plants at Mitchell, Gering, Scottsbluff, Bayard, and vicinity, pollute this stretch of the river so as to interfere with aquatic life, use of the river for recreation, fishing, boating, aesthetic enjoyment, and as a potential source of municipal and industrial water supply.

5. Adequate waste treatment facilities installed in Wyoming to abate pollution of the river as it crosses the State line and the installation of waste treatment facilities to treat adequately the municipal and industrial wastes being discharged into the river from sources in Nebraska are both needed to abate pollution of the North Platte River.

6. Cognizance is taken of progress made by sugar beet plants in Wyoming and Nebraska in treating their industrial wastes. However, the objective sought is improvement of the water quality of the river so as to allow its full use for fishing, as a wildlife habitat, for recreational purposes, and as a potential source of water supply for municipal and industrial uses.

7. The Public Health Service, in cooperation with State agencies, municipalities and industries involved, will conduct an investigation and study of the river during the current 1961-62 sugar beet campaign to obtain bacteriological, biological, chemical, stream flow, and other pertinent data to properly assess the sources of industrial and municipal wastes, the kinds of coliform bacteria present in the river, and their effects on water quality.

8. The data obtained by the investigation and study will be made available to the interested State agencies, municipalities, industries, and other interested parties.

9. After completion of the investigation and study, the conference will be reconvened by the chairman to consider the results obtained and to agree on action to be taken to abate pollution of the North Platte River.

GSA-KANSAS CITY-62-359

SECOND SESSION

CONFERENCE IN THE MATTER OF POLLUTION OF THE INTERSTATE WATERS OF THE NORTH PLATTE RIVER

WYOMING-NEBRASKA

Pursuant to notice, this Conference convened at nine a.m. on Wednesday, March 21, 1962, in the State Highway Department Building (Auditorium), Cheyenne, Wyoming.

CHAIRMAN OF THE CONFERENCE:

Murray Stein
Chief, Enforcement Branch
Division of Water Supply and Pollution Control
Public Health Service
Washington 25, D. C.

CONFEREES:

Herbert C. Clare
Regional Program Director
Water Supply and Pollution Control
Public Health Service, Region VI
Kansas City, Missouri

Arthur E. Williamson
Director, Division of Environmental Sanitation
Wyoming Department of Public Health
State Office Building
Cheyenne, Wyoming

S. A. Christensen
Chairman, Wyoming Stream Pollution Control
Advisory Council
Evanston, Wyoming

E. A. Rogers, M.D.
Director of Health
Nebraska Department of Health
Lincoln, Nebraska

John S. Samson
Chairman, Nebraska Water Pollution
Control Council
Omaha, Nebraska

CHAIRMAN STEIN: The Conference is open.

This second session of the Conference on pollution of the interstate waters of the North Platte River, involving the States of Wyoming and Nebraska, is being held under the provisions of the Federal Water Pollution Control Act. Under Section 8 of that Act, pollution of interstate waters which endangers the health or welfare of persons in a State other than that in which the pollution occurs is subject to abatement.

The first step in this procedure is the calling of a Conference. The purpose of the Conference is to bring together the States and the Department of Health, Education, and Welfare to lay a basis for future action and to give States and localities and industries an opportunity to take any action which may be indicated under State and local law. The Conference technique we have found is a very useful one in getting the States and Federal Government together and moving forward on segments of river basins to get indicated remedial and corrective action initiated.

For the purpose of the record, we would like to indicate the area we are covering here, and for the purpose of some of the people who weren't here at the first session.

The North Platte River rises in Jackson County in Colorado, from whence it flows northerly into the State of Wyoming. It then follows the pattern of a large loop, flowing through southeastern Wyoming, northerly, easterly, and southeasterly, and crosses the Wyoming State line near Torrington, Wyoming, into Scottsbluff County, Nebraska. It courses through the southerly part of the State of Nebraska until it is joined by the South Platte River in Lincoln County, Nebraska. As the Platte River, it continues easterly across Nebraska to its confluence with the Missouri River below Omaha, Nebraska. The North Platte River Basin embraces an area of approximately 32,000 square miles, extending from north central Colorado to southeastern Wyoming and western Nebraska, and the river's waters are used for a number of beneficial purposes, including irrigation, industrial application, municipal water supply, fishing, boating, and other recreational uses.

In accordance with a written request dated July 21, 1961, of Dr. E. A. Rogers, Director of Health, Nebraska Department of Public Health, acting in behalf of the Nebraska

State Water Pollution Control Council, the Surgeon General called a Conference in the matter of the pollution of the interstate waters of the North Platte River and its tributaries in Nebraska and Wyoming under the provisions of Section 8 of the Federal Water Pollution Control Act.

Since the holding of the first session, the Congress has amended the Federal Water Pollution Control Act and this and subsequent actions are being held in the name of the Secretary of Health, Education, and Welfare.

The Act requires the calling of such a Conference when requested by a state water pollution control agency, and the first session of the Conference was held on September 12, 1961, at the City Hall in Scottsbluff, Nebraska.

At this Conference, the Chairman pointed out that under the Federal Water Pollution Control Act, pollution of interstate waters which endangers the health or welfare of persons in a State other than that in which the discharges originate is subject to abatement under procedures described in Section 8 of the Federal Act.

The first step of this procedure is the calling of a Conference, and the purpose of the Conference is to bring the States and the Public Health Service together to lay a basis for future action.

In the light of Conference suggestions after the first session of the Conference, the Conferees unanimously agreed to the following conclusions and recommendations:

1. That the North Platte River below Torrington, Wyoming, is an interstate stream within the meaning of the Federal Water Pollution Control Act.

2. That pollution of interstate waters subject to abatement under the Federal Water Pollution Control Act is occurring in this stretch of the North Platte River.

3. That the river above Torrington is a relatively clean stream.

4. That discharges of industrial wastes from a plant in Torrington, Wyoming, sewage from Lyman, Morrill, Scottsbluff, Gering, Minatare, Melbeta, Bayard, Bridgeport, Nebraska, and industrial wastes from plants at Mitchell, Gering,

Scottsbluff, Bayard, and vicinity, pollute this stretch of the river so as to interfere with aquatic life, use of the river for recreation, fishing, boating, aesthetic enjoyment, and as a potential source of municipal and industrial water supply.

Adequate waste treatment facilities installed in Wyoming to abate pollution of the river as it crosses the State line and installation of waste treatment facilities to treat adequately the municipal and industrial wastes being discharged into the river from sources in Nebraska are both needed to abate pollution of the North Platte River.

Cognizance is taken of progress made by sugar beet plants in Wyoming and Nebraska in treating their industrial wastes. However, the objective sought is improvement of the water quality of the river so as to allow its full use for fishing, as a wildlife habitat, for recreational purposes, and as a potential source of water supply for municipal and industrial uses.

The Public Health Service, in cooperation with State agencies, municipalities, and industries involved, agreed to conduct an investigation and study of the river during the then current 1961-62 sugar beet campaign to obtain bacteriological, biological, chemical, stream flow, and other pertinent data to assess properly the sources of industrial and municipal wastes, the kinds of coliform bacteria present in the river, and their effects on water quality.

The data obtained by the investigation and study would be made available to the interested State agencies, municipalities, industries, and other interested parties. After completion of the investigation and study, the Conference would be reconvened by the Chairman to consider the results obtained and to agree on action to be taken to abate pollution of the North Platte River.

This study has been completed and the Conference has been reconvened here today.

We should like to point out that under the law this is a Conference between the Department of Health, Education, and Welfare and the States concerned. The States under the law can bring anyone they wish to the Conference to participate and assist the Conferees in arriving at conclusions.

The Conferees are as follows:

Dr. E. A Rogers, of the Nebraska Department of Health.

Mr. John S. Samson, of the Nebraska Water Pollution Control Council.

Mr. S. A. Christensen, Chairman of the Wyoming Stream Pollution Control Advisory Council.

Mr. Arthur E. Williamson, of the Wyoming Department of Public Health.

Mr. Herbert Clare, who is the Regional Program Director for the Water Pollution Control Program of the Public Health Service, with headquarters at Kansas City, Missouri.

And my name is Murray Stein, and I am from the Department of Health, Education, and Welfare, headquarters in Washington, D. C.

In past Conferences, the way we found it most helpful to proceed is to call on each of the Conferees to make a statement, and their invitees will also be called upon to make a statement. At the conclusion of each statement, the Conferees will be given an opportunity to ask questions or make comments. At the conclusion of this procedure, we will have a general discussion and then try to summarize and determine where we are going from here.

We are taking a verbatim transcript of the Conference. Mrs. Virginia Rankin is making this transcript. This transcript, as well as the summary report which we are required to prepare by law, will be made available to the state water pollution control agencies represented at the Conference. Any others who want copies of the summary report or the transcript should get in touch with their respective state water pollution control agencies and they will make copies available to you. We would suggest that persons who are called to make statements come up to the lectern and make the statements from the lectern.

With that, I think we will proceed with calling on the Public Health Service for a statement. Mr. Clare.

MR. CLARE: Thank you, Mr. Chairman.

I have a brief statement, since actually a lot of material in our introductory statement was included at the

Scottsbluff Conference.

I wonder, before I start this, would it be in order to make some introductions, Mr. Chairman?

CHAIRMAN STEIN: That will be fine.

MR. CLARE: Or should we do that later?

CHAIRMAN STEIN: No, that would be fine now.

MR. CLARE: I should like to introduce the representatives of the Public Health Service Region VIII Office. Mr. Stein has indicated that this is an inter-regional Conference in effect. So I should like to introduce Mr. Joseph W. Fitzpatrick, Chief of the Water Quality Section of the Public Health Service Regional Office at Denver.

Joe, if you would introduce your staff, I would appreciate it.

MR. FITZPATRICK: Thank you. I would like to introduce two members of our staff that have worked actively on these studies on the North Platte, and that would be Mr. Martin A. Bauer, Jr., and Mr. Keith Carswell.

I would like to express the regret of Mr. Nasi, who is our Regional Program Director, and couldn't be here today because of a death in his wife's family.

Thank you very much.

MR. CLARE: We would like to call on you later, Joe, for some comments in case you would care to make them.

MR. FITZPATRICK: Yes, sir.

MR. CLARE: I should like at this time to introduce some of the workers on the survey from the Public Health Service Regional Office at Kansas City.

I would like to introduce Donald A. Townley, Chief of our Enforcement Section. And with Don is his assistant engineer, Richard Hunsinger.

Dr. Joe Neel will be introduced later. He will present a paper or a report, so we will introduce him later.

On Dr. Neel's staff is Mr. Donald W. Marshall, Senior Sanitary Engineer, who also assisted on the survey.

There are some other Federal agency representatives here today, and I should like to introduce them later if I might after the Public Health Service reports are presented and call on them at that time for any statements or comments they should care to make.

As Mr. Stein has indicated, the North Platte River is of importance to the States of Nebraska and Wyoming. In fact, the North Platte is an important tributary of the Platte River, which in turn has material significance in the Missouri Basin as a whole. So the Platte has been highly developed for various uses, as we will see in the reports today. It has also been intensively studied as far as water quality is concerned. There are such names in these studies as Williamson, Filipi, Neel, Hopkins, and others. We will find, I am sure, that there are many uses made of the North Platte, especially for irrigation and recreational use.

So with these brief remarks, Mr. Chairman, I think we might start with the Public Health Service presentation.

CHAIRMAN STEIN: Will you introduce your first?

MR. CLARE: All right. I should like to introduce Mr. A. D. Sidio, Public Health Engineer in the Field Operations Section from our Sanitary Engineering Center. Mr. Sidio was in charge of the survey that was made on the North Platte River last fall.

I would like to call on you for your report, Mr. Sidio.

CHAIRMAN STEIN: While Mr. Sidio is coming up, I might indicate our tentative thinking about the program now. We expect to have a coffee break at about 10:30 and adjourn for lunch somewhat before 12:00, and because of the location here to have about an hour and three quarters or two hours for lunch, and then reconvene and complete this this afternoon.

Mr. Sidio.

MR. SIDIO: Thank you.

During the month of December 1960 studies were made to determine the effects of wastes on bacteriological, chemical, and physical quality of the North Platte River. The area studied extended from above Torrington, Wyoming, downstream to Bridgeport, Nebraska, a distance of about 67 miles.

In November of 1960 studies of the biology of the North Platte River from above Torrington to Mitchell, Nebraska, were made. Additional biological studies were made during August 1961. The stretch of the river involved during the August studies extended from above Torrington to Bridgeport, Nebraska.

As a result of the studies, and at the request of the State of Nebraska, a Conference was held on September 12, 1961, at Scottsbluff, Nebraska. The Conference recommended in part that: "The Public Health Service, in cooperation with State agencies, municipalities and industries involved, will conduct an investigation and study of the river during the current 1961-62 sugar beet campaign to obtain bacteriological, biological, chemical, stream flow, and other pertinent data to properly assess the sources of industrial and municipal wastes, the kinds of coliform bacteria present in the river, and their effects on water quality."

In September and November, 1961, the Public Health Service conducted stream studies to obtain the necessary data to properly assess the sources of industrial and municipal wastes. This report covers the chemical, bacteriological, and physical data obtained during the September and November 1961, studies.

Additional background material is available on the area in:

1. Report on Pollution of Interstate Waters of the North Platte River, Wyoming-Nebraska, September 1961. Prepared by Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio.

2. North Platte River Basin, Water Pollution Investigation, January 1951. Prepared by Public Health Service, Division of Water Pollution Control, Missouri Drainage Basin, Kansas City, Missouri.

The September and November 1961 studies covered the Torrington, Wyoming to Broadwater, Nebraska reach of the

North Platte River. This is a distance of about 82 river miles. The reach of the river covered is shown in Chart 1.

I would like to introduce Chart 1.

CHAIRMAN STEIN: I think since this is a Conference and not a hearing, when you refer to a chart or anyone refers to a chart, they will automatically be introduced.

There is just one thing we will not guarantee, and that is we can't say we are going to reproduce for the record any colored slides or colored photos, because the reproduction of that raises the price of the transcript many, many times. But the charts will be received in the record.

MR. SIDIO: Chart 1 shows the area studied during the two studies of 1961 from Torrington, Wyoming, to Broadwater, Nebraska. The lines coming into the river indicate sources of wastes. The black circles on the river and the two tributaries indicate the sampling stations used during the two studies.

The river is used as a source of supply for the extensive irrigation systems and to receive the runoff of drains returning flow from the irrigated areas. The river is used as a source of industrial water supply. This use is supplemented by ground water sources and surface sources of the river's tributaries.

At the present time, there is no known use of this reach of the North Platte as a municipal water supply; however, this is a potential use that must be considered.

Fishing and duck hunting are the primary recreational uses of the river and tributary surface waters in the area. The broad shallow depth of the river limits other recreational uses such as boating and swimming.

There are thirteen sewered communities in the reach of the river studied. These communities are listed in Table 1. The table also lists the contribution of bacterial pollution to the stream from each of the communities.

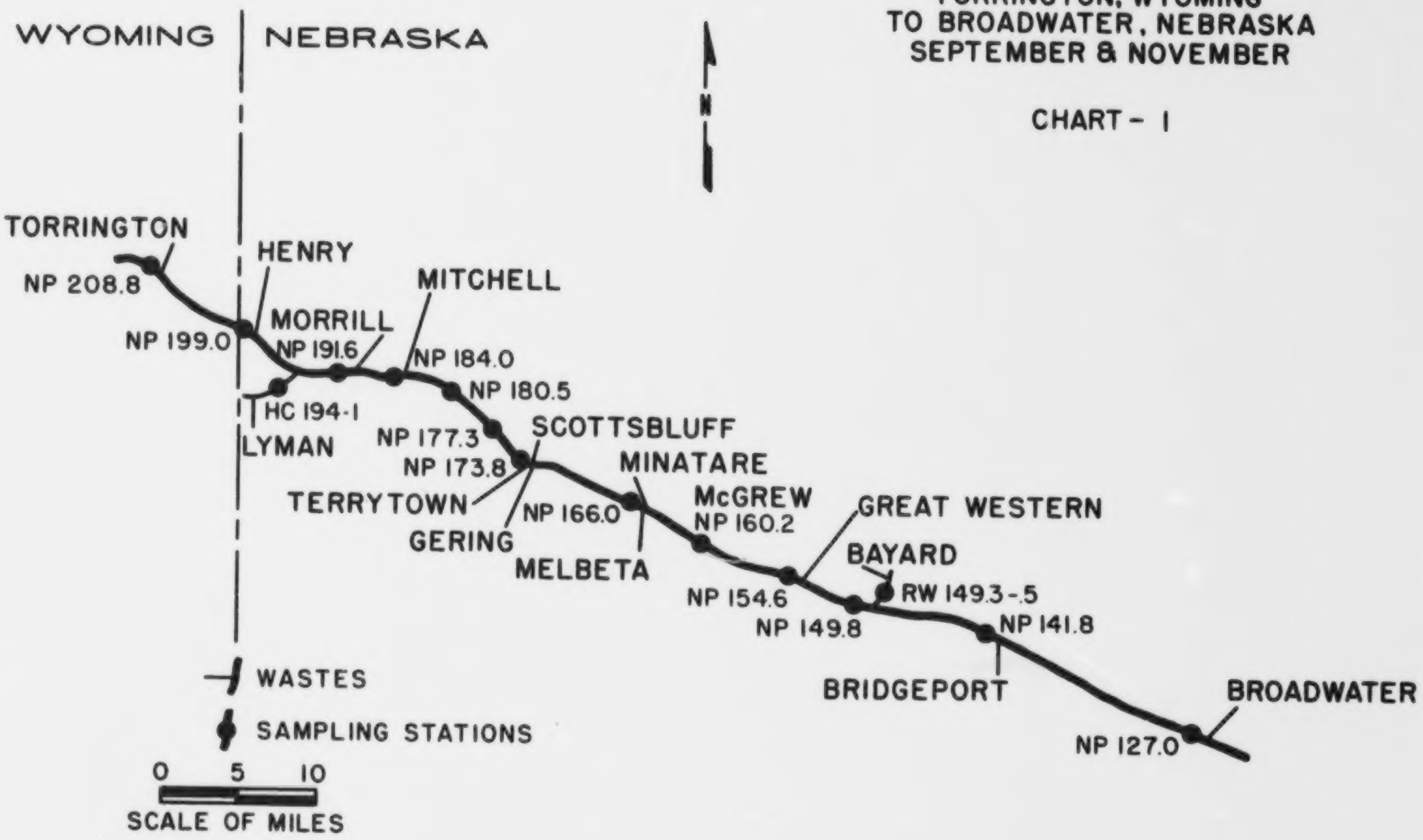
CHAIRMAN STEIN: Mr. Sidio, you have tables in your reports?

MR. SIDIO: I have, yes.

NORTH PLATTE RIVER SURVEY

TORRINGTON, WYOMING
TO BROADWATER, NEBRASKA
SEPTEMBER & NOVEMBER

CHART - 1


WYOMING
NEBRASKA
N
TORRINGTON
NP 208.8
HENRY
NP 199.0
MORRILL
NP 191.6
MITCHELL
NP 184.0
NP 180.5
HC 194-1
LYMAN
NP 177.3
NP 173.8
SCOTTSBLUFF
TERRYTOWN
GERING
NP 166.0
MINATARE
MELBETA
McGREW
NP 160.2
GREAT WESTERN
BAYARD
RW 149.3-.5
NP 154.6
NP 149.8
NP 141.8
BRIDGEPORT
BROADWATER
NP 127.0
WASTES
SAMPLING STATIONS
0
5
10
SCALE OF MILES

NORTH PLATTE RIVER SURVEY

Wyoming-Nebraska

September and November 1961

TABLE No. 1

SEWERED COMMUNITIES

	River Mile	Sewered Population	Bacterial Population Equivalent To Stream
Wyoming			
Torrington (1)	209	3,500	0
Nebraska			
Henry (1)	199	80	80
Lyman (1)	194-3.5	350	350
Morrill (1)	191	600	600
Mitchell (1)	184	1800	1800
Scottsbluff (2)	173	11000	11000
Terrytown (2)	173.8	660	660
Gering (2)	173	3500	3500
Minatare (1)	166	800	800
Melbeta (1)	166	80	80
Bayard (1)	155	1700	1700
Bridgeport (1)	142	1000	1000
Broadwater (1)	127	150	150

(1) Data from U.S.P.H.S. 1957 Inventory of Municipal and Industrial Waste Facilities.

(2) Computed from 1957 U.S.P.H.S. Inventory of Municipal and Industrial Waste Facilities, 1960 Census figures and engineering reports prepared for the cities based on estimated populations for 1958.

CHAIRMAN STEIN: Would you want these included in your record as read?

MR. SIDIO: I would like all of them.

CHAIRMAN STEIN: Without objection.

MR. SIDIO: Very good.

Chart 2 presents the sources of sewage to the North Platte River from Torrington to Broadwater. The diameter of the circles indicate the relative contributions from the various sources.

This circle in the lower left represents the bacterial population equivalent of 1,000 introduced into the river by the municipalities in the region studied from Torrington to Broadwater. For instance, here at Torrington there are no wastes from the municipality being discharged into the river. At the other municipalities you can see their relative quantities being discharged.

At the time of the 1961 studies Torrington, Wyoming, was the only community providing adequate treatment for its sewage. All other communities in the area discharge raw sewage to the river, though some have taken steps toward providing treatment for their wastes. Scottsbluff, Gering, and Terrytown have had engineering studies made. Additional progress has been made or is being considered toward providing adequate municipal treatment facilities.

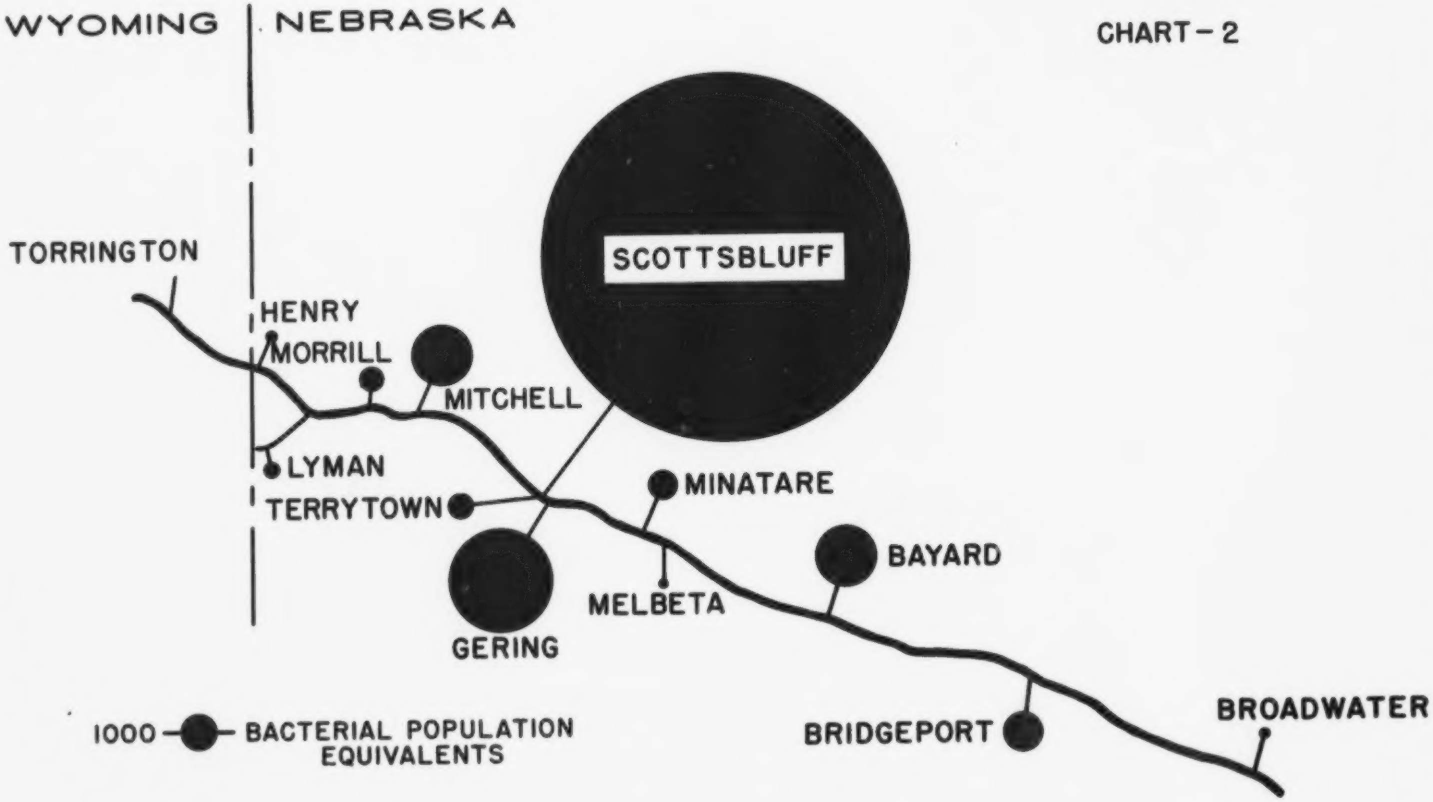
Table 2 lists the known sources of organic waste being discharged to the river. This table includes both municipal and industrial sources. Chart 3 presents the Biochemical Oxygen Demand population equivalents from each community. Again the diameter of the circle indicates the relative contribution from various sources. This table is based on the Biochemical Oxygen Demand loads being discharged to the river during the November 1961 study. This includes both municipal and industrial wastes. Here where Torrington had none before, you can see the relative load that they have going into the river during the November period. The circle in the lower left of the chart represents a BOD population equivalent of 100,000 people.

Untreated municipal wastes and other year-round waste discharges and the seasonal waste loads of the five beet sugar plants were of major concern.

SOURCES OF SEWAGE
SEPTEMBER 1961

NORTH PLATTE RIVER SURVEY
WYOMING – NEBRASKA
SEPTEMBER & NOVEMBER

CHART – 2


WYOMING
NEBRASKA
TORRINGTON
HENRY
MORRILL
MITCHELL
SCOTTSBLUFF
LYMAN
TERRYTOWN
MINATARE
GERING
MELBETA
BAYARD
BRIDGEPORT
BROADWATER
1000 — ● — BACTERIAL POPULATION EQUIVALENTS

NORTH PLATTE RIVER SURVEY

Wyoming-Nebraska

September and November 1961

TABLE No. 2

SOURCES OF ORGANIC WASTES

Source	River Mile	BOD Population Equivalent Individual Source	Total For Area
Wyoming			
Torrington	209	0	606,000
Holly Sugar Co.(1)		606,000	
Nebraska			
Henry(2)	199	80	580
Platte Valley Poultry(2)		500	
Lyman(2)	194-1	350	350
Morrill(2)	191	840	840
Mitchell(2)	184	2,600	206,600
Gr. Western Sugar Co.(1)		204,000	
Scottsbluff(3)	173	12,250	599,680
Co-op. Oil Refinery(2)		1,200	
Flicker Packing(2)		550	
Gr. Western Sugar Co.(1)		580,000	
H & B Packing Co.(2)		720	
Hersch Packing Co.(2)		1,160	
Idlewild Dairy(2)		1,600	
Scottsbluff Rendering(2)		2,200	
Terrytown(3)	173.8	660	660
Gering(3)	173	3,500	133,600
Gr. Western Sugar Co.(1)		97,000	
Miller Packing Co.(2)		100	
Swift & Co. Packing(2)		33,000	
Melbeta(2)	166	80	80
Minatare(2)	166	800	800
Bayard(2)	150	1,700	17,200
Gr. Western Sugar Co.(1)		15,500	
Bridgeport(2)	142	2,390	2,390
Broadwater(2)	127	150	150
		TOTAL FOR REACH	1,568,930

(1) Computed from data collected during November 1961 Study - See Table 5.

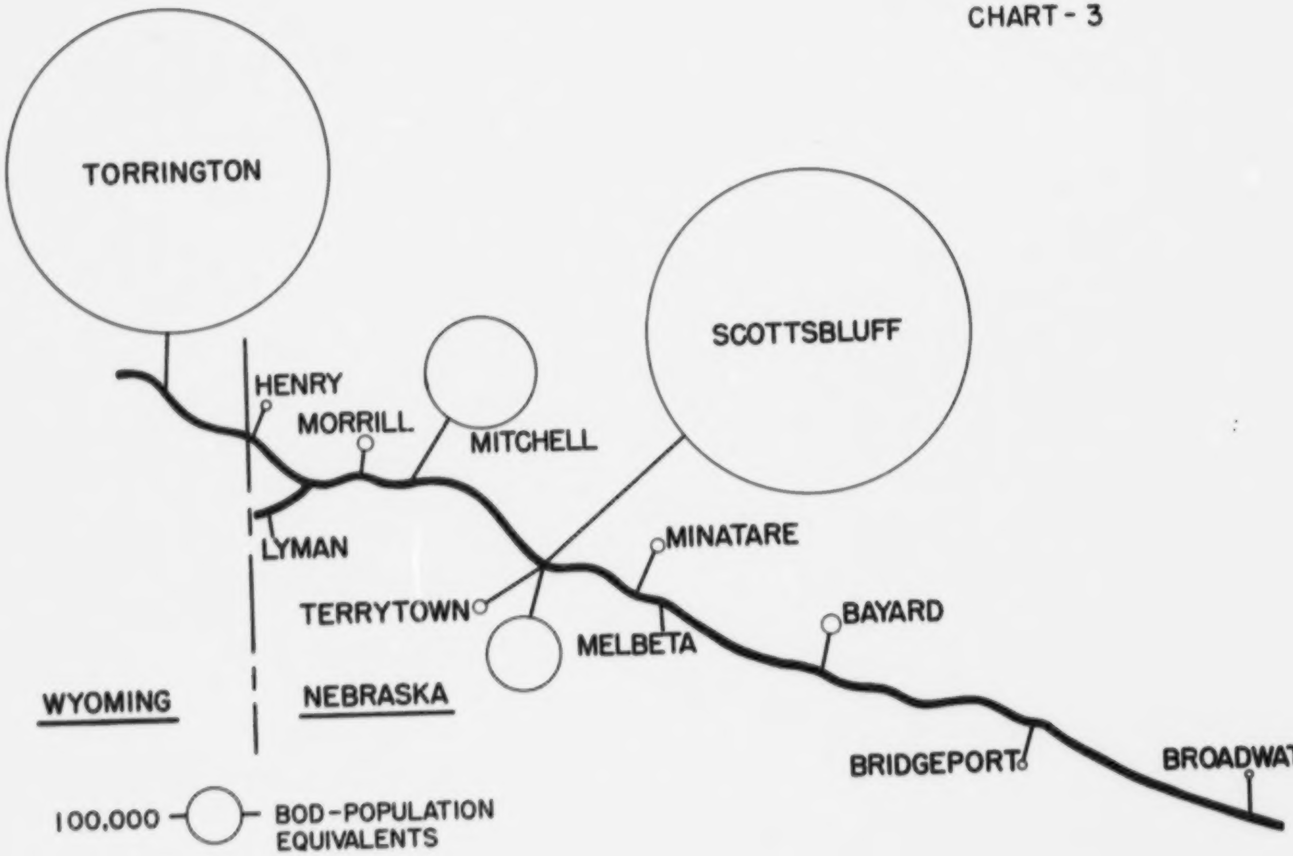
(2) Data from U.S.P.H.S. 1957 Inventory of Municipal and Industrial Waste Facilities.

(3) Computed from U.S.P.H.S. 1957 Inventory of Municipal and Industrial Waste Facilities, 1960 Census Figures, and Engineering Reports prepared for the cities based on estimated populations for 1958.

SOURCES OF ORGANIC WASTES
NOVEMBER 1961

NORTH PLATTE RIVER SURVEY
WYOMING – NEBRASKA
SEPTEMBER & NOVEMBER

CHART - 3


TORRINGTON
SCOTTSBLUFF
HENRY
MORRILL
MITCHELL
LYMAN
MINATARE
TERRYTOWN
MELBETA
BAYARD
WYOMING
NEBRASKA
BRIDGEPORT
BROADWATER
100,000
BOD-POPULATION
EQUIVALENTS

Of the five beet sugar plants, one is in Wyoming and four in Nebraska. Various measures have been taken by each of these plants that has resulted in reducing the potential waste load to the river. A number of these measures have been taken for the direct purpose of reducing pollution. Other waste load reductions have resulted from process changes.

Changes that have been made at each of the beet sugar plants that have reduced the potential waste load to the river, along with the wastes discharged during the November 1961 study, are discussed in Appendix D.

Mr. Chairman, I also have four sections in the Appendix that I would like to introduce as part of the record.

CHAIRMAN STEIN: Without objection, we will include those in the record.

MR. SIDIO: SURVEY METHODS.

Two studies of the effects of pollution on chemical, bacteriological, and physical quality were made of the Torrington, Wyoming, to Broadwater, Nebraska, reach of the North Platte River. The first study was conducted during September 21 through 28, 1961, just prior to the 1961-62 beet sugar processing campaign. The second was during November 7 through 20, 1961, approximately one month after the campaign had started.

Sampling stations were selected at points considered to be most desirable for determining the quality of the river above and below discharges of the various wastes. Table 3 lists the sampling stations by number, river miles, and description.

During the September study, samples were collected once daily at each of the 15 stream stations and the waste discharge line of the Gering sugar plant. Sampling times at individual stations were varied between 7:00 A.M. and 3:30 P.M. by changing starting times and the order of sampling.

During November, samples were collected daily for fourteen days from the fifteen stream stations. In addition, daily samples were collected for bacteriological analysis and temperature readings from each of the six stations on the beet sugar plant waste ditches. Sampling times were varied during the first twelve days from 6:30 A.M. to 4:30 P.M. On the last

NORTH PLATTE RIVER SURVEY

Wyoming-Nebraska

September and November 1961

TABLE No. 3

STATION No. 1 (NP-208.8) --- Torrington Bridge.

U. S. Hwy. 85, Southern edge of Torrington, Wyoming, above the sources of wastes considered in this study.

STATION No. 2 (NP-199.0) --- Henry Bridge.

State Hwy. 92 about 1 mile south of Henry, Nebraska. Sec. 4-R58W-T23-N. Approximately 10 miles below Torrington, and Holly sugar plant outfall.

STATION No. 3 (HC-194-1) --- Bridge crossing Horse Creek.

Approximately 1 mile upstream of confluence with North Platte. Approximately 3 miles Northeast of Lyman, Nebraska. Sec. 25-R58W-T-23-N.

STATION No. 4 (NP-191.6) --- Bridge south of Morrill.

State Spur 226 about 2 miles south of Hwy. 26. Line Secs. 27-28-R-57W-T-23N. Approximately 17 miles below Torrington, and Holly sugar plant outfall. Above Morrill discharge.

STATION No. 5 (NP-184) --- Bridge south of Mitchell.

On paved Hwy. about 1 mile south of Mitchell, Nebraska. Line Secs. 33-34-R56W-T-23N. Approximately 25 miles below Torrington - below Morrill discharge - above Mitchell discharge and Great Western Mitchell plant discharge.

STATION No. 6 (NP-180.5) --- Point about midway between Mitchell and Riverside, Nebraska.

Wade sample on John B. Cook property - about midpoint of Sec. 1 -R56W-T-22N. Below Mitchell and Great Western Mitchell plant discharge.

TABLE No. 3
(Continued)

STATION No. 7 (NP-177.3) --- Bridge west of Scottsbluff on 20th. St.

Sec. 20 R55W-T-22N. Below Mitchell and Great Western Mitchell plant discharge.

STATION No. 8 (NP-173.8) --- Bridge between Scottsbluff, Terrytown and Gering.

Sec. 26 R55W-T22N. Above Scottsbluff, Terrytown and Gering discharges; also above Great Western's Scottsbluff and Gering plant discharges.

STATION No. 9 (NP-166.0) --- Minatare - Melbeta Bridge.

On line of Sec. 13 R54W-T21N - and Sec. 18 R53W-T21N. Below Scottsbluff, Terrytown and Gering area discharges, including the two sugar plant discharges.

STATION No. 10 (NP-160.2) --- Bridge north of McGrew.

Secs. 25 and 36 - R53W-T21N. Below Scottsbluff, Terrytown and Gering area discharges.

STATION No. 11 (NP-154.6) --- Bridge on U. S. Hwy. 26 about 1-1/2 miles south of Bayard, Nebraska.

Secs. 9-4, R52W-T20N. Above Bayard and Great Western Bayard plant discharges.

STATION No. 12 (NP-149.8) --- Belmont Diversion Dam.

Sec. 18 - R51W-T20N. Below Great Western Bayard plant discharge; above Bayard municipal waste discharge to the North Platte.

STATION No. 13 (RW-149.3-0.5) Red Willow Drain.

Sec. 17-R51W-T20N. Approximately 6 miles southeast of Bayard, Nebraska. Carries Bayard municipal wastes.

STATION No. 14 (NP-141.8) --- Bridge U. S. Hwy. 26 about 1/4 mile north of Bridgeport, Nebraska.

Sec. 28-R50W-T20N. Below Bayard municipal wastes, and Great Western Bayard plant discharge; above Bridgeport municipal discharge.

TABLE No. 3
(Continued)

STATION No. 15 (NP-127) --- Bridge Hwy. 26 south of Broadwater, Nebraska.

Sec. 33-R48W-T19N. Below Bridgeport discharge and above Broadwater discharge.

STATION No. 16 (GG-173-1.5) --- Great Western Sugar Company, Gering plant waste ditch.

STATION No. 19 (HT-208.8) --- Holly Sugar Company, Torrington plant outfall.

STATION No. 20 (GM-184-1.5) --- Great Western Sugar Company, Mitchell plant waste ditch.

STATION No. 21 (GS-173.8-3.0) - Great Western Sugar Company, Scottsbluff Plant waste ditch.

STATION No. 22 (GB-150-2.5) -- Great Western Sugar Company, Bayard Plant discharge to broadfield irrigation system.

STATION No. 23 (GB-150-2.0) -- Great Western Sugar Company, Bayard Plant effluent from broadfield irrigation system.

STATION No. 24 (MG-173-1.5) -- Gering municipal waste line. Designated "Outlet No. 1" in engineering report prepared for City in February 1959.

two days of the survey, November 19 and 20, samples were collected between 1:30 and 7:30 A.M. Eight-hour composite samples for chemical analysis were collected from each of the plant waste ditches for four consecutive days.

All analyses, with the exception of those on samples returned to Cincinnati for chloride, calcium, sulfate and sodium analyses, were made in a mobile laboratory.

The laboratory was located on the grounds of the Scottsbluff municipal building in Scottsbluff, Nebraska.

Additional laboratory facilities were made available by the Western Branch of the Nebraska State Health Department located in Scottsbluff. These facilities were used primarily for sterilization and preparation of media.

Approximately 600 samples were received in the mobile laboratory during the 21 days of sampling. Approximately 5,700 chemical, physical, and bacteriological analyses were run on the samples.

All analyses, with the exception of two, were performed in accordance with "Standard Methods for the Examination of Water and Wastewater" eleventh edition, 1960. The two exceptions were the examinations for fecal coliform and fecal streptococci. Descriptions of the methods used in determining the fecal coliform and fecal streptococci densities are included in the Appendix C.

Chemical and physical analyses included: temperature, dissolved oxygen (D.O.), 5-day 20-degree Centigrade biochemical oxygen demand (B.O.D.), suspended solids, volatile suspended solids, hydrogen ion concentration (pH), alkalinity, chloride, hardness, calcium, magnesium, conductivity, color, turbidity, sodium, and sulfate.

Bacteriological determinations included: most probable number (MPN) for total coliform group, MPN for fecal coliform, and fecal streptococci by the membrane filter method.

Physical observations of the river were made routinely during the studies by sampling personnel and at opportune times by supervisory personnel.

Stream flow data during the two study periods were provided by the State of Nebraska, Department of Water Resources, Bridgeport, Nebraska, and the U. S. Geological Survey, Casper, Wyoming.

Time of travel was based on a velocity of 2.2 feet per second, or 1.5 miles per hour.

Flow measurements were made on each of the five beet sugar plant wastes during the November study. During the September study, waste flow measurements were made on the Gering plant discharge line only. Wastes, originating from stockyards, were being discharged to the Gering plant waste line prior to its point of discharge to the waste ditch.

Flow measurements of the sugar plant waste ditches during the November study were made by means of a Parshall flume, with the exception of the Holly Sugar Company Torrington plant. Measurements were made of the Torrington plant wastes by means of two 2.5 feet opening rectangular weirs located in the new screen house. A flow level recording device was installed and placed in operation by personnel of the Wyoming State Engineers' Office.

The Parshall flume used during the study was designed by the Engineering Department, and constructed by the maintenance shop of the Great Western Sugar Company in Scottsbluff. The unit was of standard design with a throat width of 24 inches.

At the Bayard plant the waste is pumped from the plant waste ditch to a distribution flume across the upper end of the broad-field irrigation system. An existing Parshall flume in the distribution system was used for flow measurements.

The bypass line provided in the waste ditch, near the pump house, in the Bayard Plant broad-field disposal system was observed flowing on numerous occasions during the November study. The method of transporting the wastes from the plant and the function of the bypass line are discussed in Appendix D. Calculations, based on flow measurements of the other plants, indicate that an average of between one-half and one cubic foot per second discharged from this line to an adjacent canal.

The Parshall flume used at the other three Great Western plants was used in the collection ditch of the broad-field irrigation system of the Bayard plant. During the early part of the November survey, a considerable amount of reconditioning was done on the broad-field system, consisting of sandbagging and diking of channels that had developed across the field. The reconditioning caused an interruption of the normal flow across the field by flooding additional areas. Flow measurements made on the collection ditch of the Bayard field are not indicative of the normal discharge from the field. The results on the Bayard plant are not considered indicative of reduction efficiencies of the field.

The results of individual sample analysis for the September and November studies are presented in Appendix A. Averages of chemical and physical data for the thirteen river stations, the two tributary stations, and the September data for Station (16) (GG-173-1.5) (Gering plant waste-discharge line) are presented in Table 4. Chemical and physical data on each of the five beet plant wastes are recorded in Table 5.

Average flow data for each of the stream stations during the two studies are presented in Table 4.

The extensive utilization of the North Platte River for irrigation purposes is indicated by the flow recorded at the state line (near Henry, Nebraska) Station (528 cfs) during the September period and the flow recorded during the same period at the Mitchell Station (212 cfs) some twenty miles downstream. During the November study, the flow increased progressively downstream in the reach considered.

Temperature measurements were made and recorded in Centigrade degrees in the field immediately following removal of the sample from the source. A comparison of average temperatures between September and November at each of the river stations is presented in Table 4.

Temperatures of the sugar plant wastes averaged from 27 degrees Centigrade to 38 degrees Centigrade. Temperatures of the wastes did not measurably affect the temperatures of the river.

Average pH values for September and November are presented in Table 4 for stream stations and in Table 5 for plant sampling stations.

Average dissolved oxygen concentrations and percentage of saturation values are presented in Table 4. During the September study, concentrations approached and in some cases exceeded saturation values to a point below the Scottsbluff-Gering-Terrytown Area. At the Minatare Station (NP-166.0), the concentration dropped to 8.1 milligrams per liter. At the next station, McGrew Bridge (NP-160.2), the concentration was

NORTH PLATTE RIVER SURVEY
WYOMING-NEBRASKA
SEPTEMBER-AND-NOVEMBER 1961

SUMMARY OF RIVER STATIONS-CHEMICAL DATA TABLE NO. 4

DATA \ STATION			1 NP208.8	2 NP199.0	3 (2) NC194.1	4 NP191.6	5 NP184.0	6 NP180.5	7 NP177.3	8 NP173.8	9 NP166.0	10 NP160.2	11 NP154.6	12 NP149.8	13(2) NP149.3-.5	14 NP141.8	15 NP127.0	16(3) OG173-1.5
FLOW Cubic feet per Second	SEPT.		528	528	56	171	212	284	324	387	462	585	665	733	145	843	1,050	0.55
	NOV.		317	317	27	406	497	541	582	627	726	807	884	951	78	1,062	1,287	-
TEMPERATURE °C.	SEPT.		12	11	11	12	12	12	12	10	13	13	13	12	13	12	13	15
	NOV.		4	4	2	4	4	5	5	5	5	5	5	5	6	4	3	-
pH	SEPT.		8.1	8.1	8.4	8.2	8.2	8.1	8.1	8.2	8.1	8.1	8.1	8.2	-	8.1	8.2	8.0
	NOV.		8.2	7.9	8.4	8.0	8.0	8.0	8.0	8.0	7.9	7.9	7.9	7.9	8.1	8.0	8.1	-
DISSOLVED OXYGEN (Elev.=4000')	SEPT.	mg/l	9.0	9.4	9.8	9.0	9.5	9.1	9.3	9.4	8.1	8.0	8.6	8.8	8.8	9.0	9.2	6.2
		%Sat.	97.0	100.0	104.0	97.0	103	99	101	97	89	89	95	95	96	98	101	71
	NOV.	mg/l	10.6	8.1	11.7	8.6	8.7	7.5	7.4	7.2	4.5	4.3	5.7	7.1	10.3	8.6	10.5	-
		%Sat.	95	72	99	76	78	68	67	65	41	39	51	64	98	76	98	-
BIOCHEMICAL OXYGEN DEMAND 5 day-20°C.	SEPT.	mg/l	1.5	1.6	2.4	2.1	2.0	2.0	2.2	2.2	4.9	4.7	4.6	4.4	-	3.4	3.6	10.4
		thousands of lbs/day	4.2	4.5	.736	1.9	2.33	3.08	3.88	4.25	12.1	14.95	16.6	17.3	-	15.54	20.4	.031
	NOV.	mg/l	1.0	48.4	1.9	26.5	20.0	25.6	19.7	15.4	33.9	27.6	21.8	19.4	1.5	17.1	11.1	-
		thousands of lbs/day	1.71	82.2	.276	58.2	53.5	74.6	61.5	51.5	132.7	120.0	104.2	99.6	.585	97.6	76.0	-
SUSPENDED SOLIDS	SEPT.	mg/l	17.6	22.6	67.4	92.0	83.4	49.0	52.6	83.1	372	465	373	290	-	387	262	24
		thousands of lbs/day	50.2	64.2	20.3	84.8	95.4	75.0	91.8	164.5	926	1,467	1,337	1,447	-	1,760	1,480	.070
	NOV.	mg/l	8.9	67.0	91.9	83.4	108	147	158	139	406	414	398	387	37.9	406	304	-
		thousands of lbs/day	15.2	114.6	13.4	241.6	288.4	427.	495.0	495.0	1,586	1,802	1,898	1,985	14.7	2,386	2,077	-
VOLATILE SUSPENDED SOLIDS	SEPT.	mg/l	7.3	9.7	17	14	7.4	10	9	12	29	35	37	30	-	32	25	15
		thousands of lbs/day	20.75	22.5	5.1	12.9	8.5	15.3	15.7	23.7	72.2	110.4	132.6	118.5	-	146.8	141.5	.045
	NOV.	mg/l	5.1	29.3	20.6	22.3	26	36	37	32	64	68	65	64	11	69	49	-
		thousands of lbs/day	8.7	50.1	3.0	48.8	70.8	105.4	115	106.7	249.7	295.8	309.6	329.0	4.25	397.8	333.7	-
TOTAL ALKALINITY as $CaCO_3$	SEPT.	mg/l	198	204	416	313	241	270	268	269	278	281	270	276	-	268	261	378
		thousands of lbs/day	546	581	125	288	275	413	468	532	698	886	968	1,090	-	1,130	1,477	1.12
	NOV.	mg/l	181	205	367	213	214	224	225	228	249	253	251	250	197	246	238	-
		thousands of lbs/day	309	350	53.6	467	574	649	708	770	973	1,100	1,198	1,282	76.6	1,406	1,626	-
TURBIDITY-UNITS	SEPT.		< 25	<26	27	112	37	38	<44	68	105	115	122	129	-	126	154	<23
	NOV.		< 25	47	69	44	40	69	71	66	123	129	122	126	<25	115	101	-
TRUE COLOR-UNITS	SEPT.		7	8	87	16	11	10	12	12	12	12	12	15	-	12	13	23
	NOV.		6.6	14	22	12	12	13	12	12	15	15	13	13	7.4	12	11	-
HARDNESS as $CaCO_3$	SEPT.	mg/l	302	301	176	253	287	284	294	295	297	300	305	308	-	309	298	326
		thousands of lbs/day	860	857	53.2	234	340	435	515	585	742	949	1,095	1,220	-	1,450	1,690	.970
	NOV.	mg/l	300	299	177	288	289	302	304	308	318	303	322	324	316	322	313	-
		thousands of lbs/day	515	510	25.8	631	775	835	955	1,040	1,250	1,320	1,530	1,660	123	1,850	2,140	-
CALCIUM as $CaCO_3$	SEPT.	mg/l	204	186	118	160	172	191	195	186	175	207	193	167	-	136	167	219
	NOV.	mg/l	171	192	122	116	176	210	178	200	240	200	200	221	204	268	154	-
(1) MAGNESIUM as $CaCO_3$	SEPT.	mg/l	98	115	58	93	115	93	99	107	122	93	112	141	-	163	131	107
	NOV.	mg/l	127	107	55	172	113	92	186	108	78	103	122	103	112	54	159	-
SPEC. CONDUCTANCE MICROMHOS/CM	SEPT.		697	733	1,235	919	846	813	819	818	827	841	821	832	-	819	783	990
	NOV.		710	779	1,335	803	797	797	795	806	825	803	830	839	744	833	786	-
CHLORIDE (Cl^-)	SEPT.	mg/l	16.2	17.9	31.7	22.4	20.3	19.5	18	20.1	22.6	23.2	23.0	25.9	-	22.8	22	41
	NOV.	mg/l	6.0	5.0	17.5	6.0	6.0	3.5	5.0	4.5	5.5	4.0	3.5	4.5	5.0	5.5	5.5	-
(4) SODIUM (Na^+)	SEPT.	mg/l	90	95	260	175	125	125	125	125	130	140	110	125	-	110	100	150
	NOV.	mg/l	68	89	270	96	92	87	89	92	88	94	93	94	69	92	85	-
(4) SULFATE ($SO_4^=$)	SEPT.	mg/l	205	210	278	246	213	197	212	214	232	256	240	268	-	243	233	187
	NOV.	mg/l	180	195	289	190	186	190	196	202	195	200	195	208	164	185	163	-

(1) Calculated.
(2) Tributary Stations.
(3) Station (16) OG173-1.5 is Great Western Sugar Plant. For November results - See Table No. 5
(4) Samples Composited and Returned to Cincinnati for Analysis.

NORTH PLATTE RIVER SURVEY
WYOMING-NEBRASKA
SEPTEMBER-AND-NOVEMBER 1961

SUMMARY OF DATA-SUGAR PLANT WASTES TABLE No. 5

DATA / STATIONS	(16)GG173-1.5 (5) GR.WESTERN GERING (Total)		(Corrctd)	(19)NP208.8 HOLLY-TORRINGTON	(20)GN184-1.5 GR.WESTERN-MITCHELL	(21)GN173.8-3.0 GR.WESTERN-SCOTTSBLUFF	(22)GB150-2.5 (2) GR.W. BAYARD PLANT (Discharge Pros)	(23)GB150-2.0 (2) GR.W. BAYARD (Effluent Fr. Field)
Flow in CFS	10.96		10.41	14.11	9.85	13.14	8.00	2.40
Tons of Beets Processed		Nov.8-9-10-11/'61		Nov.12-13-14-15/'61	Nov.12-13-14-15/'61	Nov. 8-9-10-11/'61	Nov.16-17-18-19/'61	Nov.16-17-18-19/'61
4-day Plant Sampling Avg/day		2,557		3,162	2,399	3,627	2,116	2,116
Nov7-20 Samplg.Per.Avg/day		(2,507)		(3,121)	(2,438)	(3,602)	(2,103)	(2,103)
Temp. °C.		35		38	27	35	30	3
pH		7.6		8.8	9.2	10.5	8.9	7.7
BOD mg/1 (5-day 20°C.)		278		1,360	666	1,395	583	204
LBS. PER DAY	16,450		16,419	103,000	35,370	98,970	85,200	2,640
PE @ 0.17 LBS./CAP./DAY	97,000		96,600	606,000	204,000	580,000	148,000	15,500
LBS.BOD/TON of Beets Proc'd.(3)		6.38		32.57	14.74	24.53	11.91	1.25
SUSPENDED SOLIDS mg/1		3,108		1,417	5,158	5,882	6,163	143
LBS. PER DAY	183,600		183,530	107,500	273,800	416,600	265,000	1,862
PE @ 0.20 LBS./CAP./DAY	918,000		917,615	537,500	1,369,000	2,083,000	1,325,000	9,310
LBS./TON of Beets Proc'd.(3)		71.78		34.00	114.08	114.86	124.24	0.88
VOLATILE SUSP. SOL. mg/1		331		326	876	948	898	49
% of SUSP. SOLIDS		10.6		23	17	16.4	14.6	34
LBS. PER DAY	19,550		19,500	24,700	46,500	67,100	38,600	640
ALKALINITY PHENOL. mg/1 as $CaCO_3$		0		82	35	155	21	0
TOTAL mg/1		224		322	191	417	209	356
HARDNESS mg/1 as $CaCO_3$		309		508	322	635	341	464
CALCIUM mg/1 (4) as $CaCO_3$		304		-	120	255	200	265
MAGNESIUM mg/1(1) as $CaCO_3$		5		-	202	380	141	199
COLOR(TRUE) UNITS		49		187	64	192	52	55
TURBIDITY-UNITS		975		1025	1750	1900	1875	123
SPEC.CONDUCTANCE MICROMHOS/cm.		794		924	658	1435	779	999
CHLORIDE (Cl^-) mg/1 (4)		5.0		43.5	10.0	6.5	31.5	8.0
SODIUM (Na^+) mg/1 (4)		67		79	49	72	75	84
SULFATE ($SO_4^=$) mg/1 (4)		147		3	12	57	28	134

(1) Calculated.
(2) Neither flow includes direct discharge of overflow pipe. Data does not include total flows.
(3) Calculations based on tons Processed - 4-day Sampling Period.
(4) Samples Composited for 4-day Sampling Period and Returned to Cincinnati for Analysis.
(5) Corrected Values - allow for flow in Gering Plant line during September.

8.0 milligrams per liter. Below McGrew, the river recovered and at the Broadwater Station (NP-127.0) had a concentration of 9.2 milligrams per liter or 101 percent saturation.

Dissolved oxygen saturation levels are inversely proportional to temperatures. With the lower temperatures recorded during November, higher concentrations of oxygen were required to reach saturation levels.

Chart 4 presents a comparison of dissolved oxygen concentration in milligrams per liter at each of the river stations for September and November.

Chart 5 presents a comparison of percent saturation values of the two study periods.

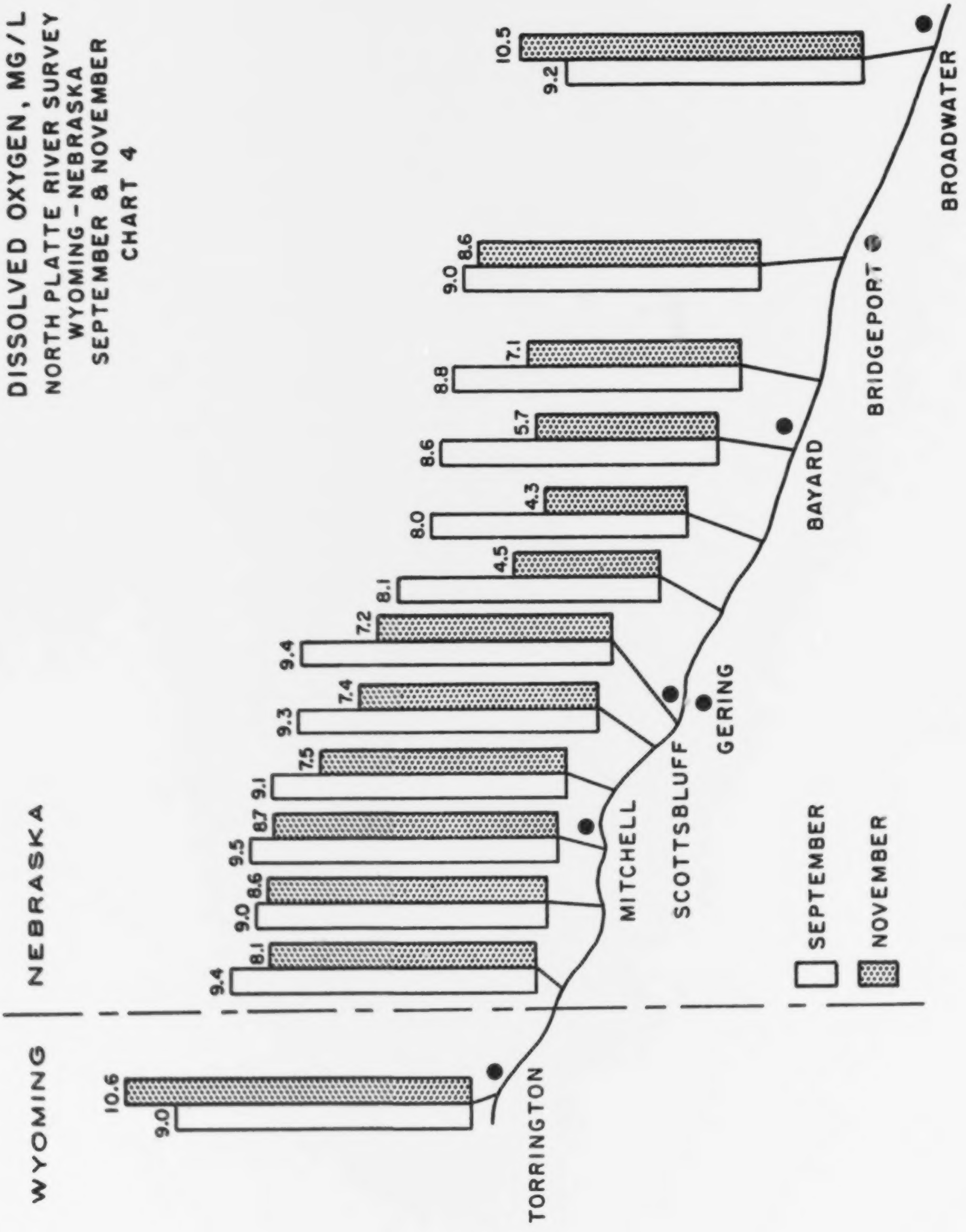
This is Chart 5 here. The open columns indicate the percent saturation values during the September study. The colored bars indicate the percent saturation values during the November study.

Table 6 presents dissolved oxygen balance data at and between each of the stream stations during the November study.

During November the D.O. at Torrington averaged 10.6 milligrams per liter or 95 percent saturation for the average temperature of 4 degrees Centigrade. At Henry (NP-199.0) below the Torrington plant wastes, the concentration dropped to 8.1 milligrams per liter or 72 percent saturation. At the next station, Morrill Bridge (NP-191.6), the D.O. started to recover. The concentration increased to 8.6 milligrams per liter or 76 percent saturation.

The average D.O. concentration at Mitchell was 8.7 milligrams per liter or 78 percent saturation. Between the Torrington and Mitchell Stations approximately 51,000 pounds of BOD per day were removed. The additional flow of 180 cubic feet per second at D.O. saturation levels would provide 10,900 pounds per day. The total oxygen required is the 51,000 pounds to reduce the BOD plus the 5,200 pounds of additional oxygen available at Mitchell as compared to the Torrington Station. The amount absorbed was 45,300 pounds in the 25-mile section. This indicates the high reaeration rate encountered in the entire reach of the river studied.

At the first station below Mitchell (NP-180.5) the dissolved oxygen dropped to 7.5 milligrams per liter or 68 percent

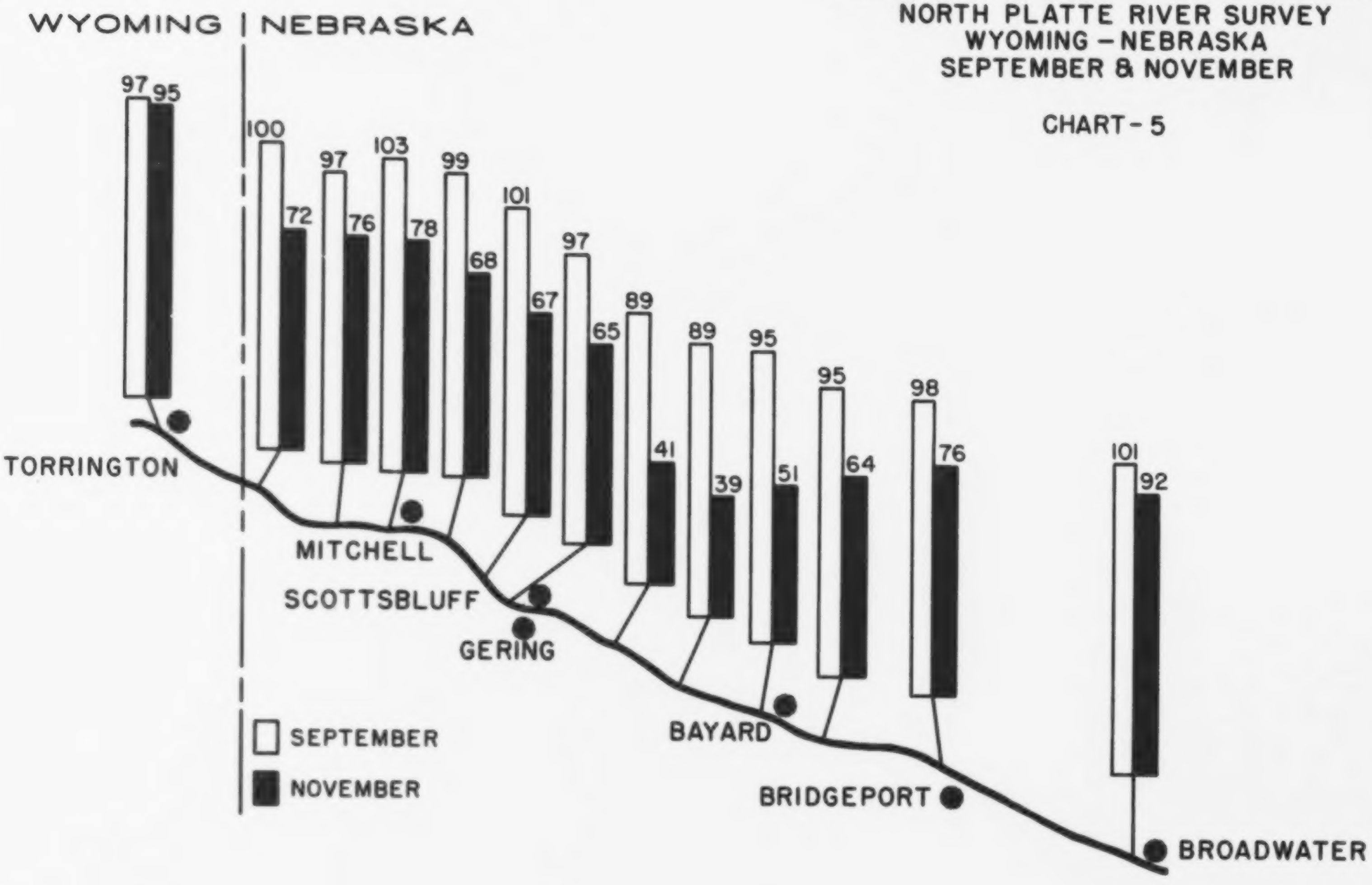


DISSOLVED OXYGEN, MG/L
NORTH PLATTE RIVER SURVEY
WYOMING - NEBRASKA
SEPTEMBER & NOVEMBER
CHART 4

DISSOLVED OXYGEN PERCENTAGE OF SATURATION

NORTH PLATTE RIVER SURVEY
WYOMING – NEBRASKA
SEPTEMBER & NOVEMBER

CHART - 5



NORTH PLATTE RIVER SURVEY

Wyoming-Nebraska

September and November 1961

TABLE No. 6

SUMMARY OF DISSOLVED OXYGEN DATA

STATION	FLOW (cfs)	D.O. mg/1	D.O. Lbs/day	D.O.Lbs/day Consumed by B.O.D. (Apparent)	(1) D.O. Lbs/day From Additional Flow	(2) D.O.Absorbed in reach Lbs/day
(1) (NP-208.8)	317	10.6	18,200			
to				22,500	0	18,200
(2) (NP-199.0)	317	8.1	13,900			
to				24,000	5,400	23,400
(4) (NP-191.6)	406	8.6	18,900			
to				4,700	5,500	3,700
(5) (NP-184.0)	497	8.7	23,400			
to				14,400	2,700	10,200
(6) (NP-180.5)	541	7.5	21,900			
to				13,100	2,500	11,900
(7) (NP-177.3)	582	7.4	23,200			
to				10,000	2,700	8,300
(8) (NP-173.8)	627	7.2	24,200			
to				42,800	6,000	30,100
(9) (NP-166.0)	726	4.5	17,500			
to				12,700	4,900	9,000
(10) (NP-160.2)	807	4.3	18,700			
to				15,800	4,650	19,650
(11) (NP-154.6)	884	5.7	27,200			
to				14,400	4,050	19,550
(12) (NP-149.8)	951	7.1	36,400			
to				2,000	6,700	8,400
(14) (NP-141.8)	1062	8.6	49,500			
to				21,600	12,400	31,500
(15) (NP-127.0)	1267	10.5	71,800			
				198,000	57,500	193,900

(1) All tributary Flow Calculated at Saturation level of 11.2 mg/1 of Dissolved Oxygen at 4° C.

(2) Balance
D.O. absorbed = D.O. End - D.O. beginning + D.O. consumed - D.O. in added flow.

saturation. From this station, the drop in dissolved oxygen continued to a point well below the Scottsbluff-Gering Area.

At the Minatare Station (NP-166.0) the D.O. dropped to an average of 4.5 milligrams per liter or 41 percent saturation. At McGrew (NP-160.2) the average D.O. dropped to 4.3 milligrams per liter or 39 percent saturation.

From McGrew to the Bayard Bridge Station, the D.O. increased to 5.7 milligrams per liter. The increase in D.O. below McGrew continued through the rest of the reach studied. At Broadwater (NP-127.0) the average D.O. was at 10.5 milligrams per liter or 92 percent saturation.

During the September study, the highest average concentration of BOD in the Torrington to Broadwater reach of the river was at the first station below the Scottsbluff-Gering Area. With the exception of the reach of river below Scottsbluff-Gering-Terrytown, the river carried loads of BOD usually found in a relatively clean stream.

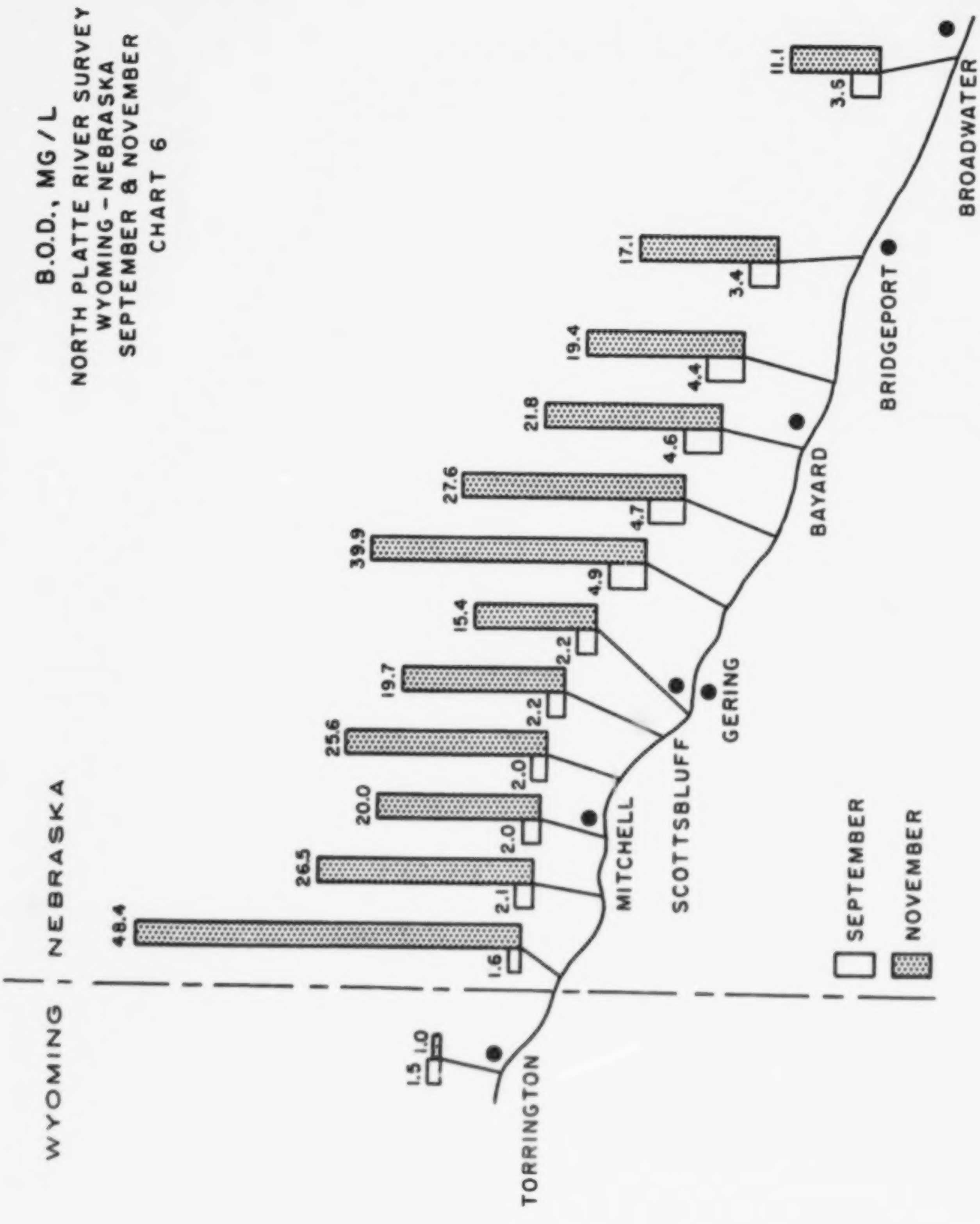
Average BOD values at each stream station for the September and November studies are presented in Table 4 in milligrams per liter and thousands of pounds per day.

At the first station below the Scottsbluff-Gering-Terrytown Area (NP-166.0) the BOD was 4.9 milligrams per liter or 12,120 pounds per day. From Minatare (NP-166.0) the concentrationsdecreased; however, the load continued to increase through the rest of the reach. The increased load was due to the BOD carried by the irrigation return water.

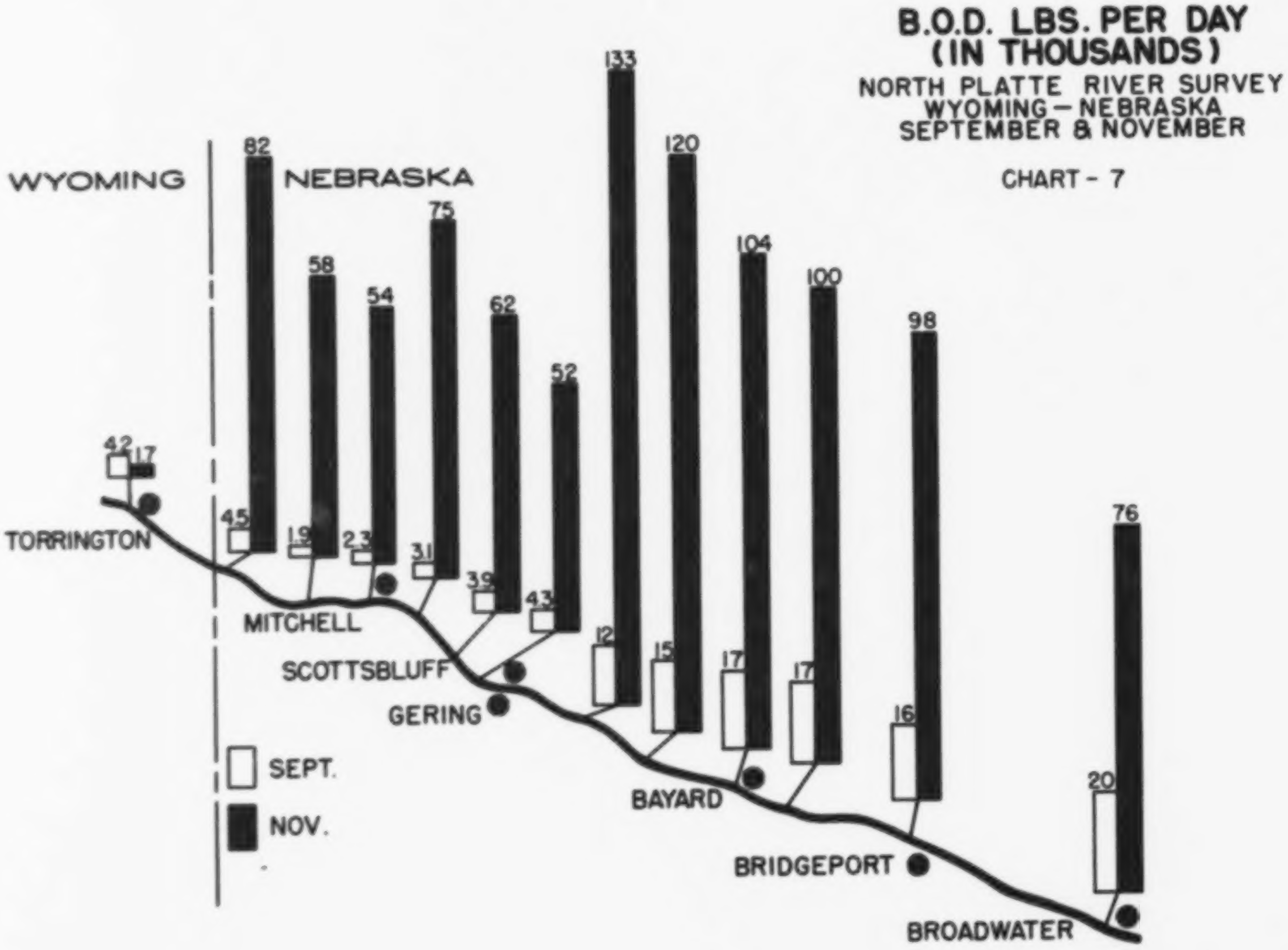
Chart 6 presents average BOD results for September and November in milligrams per liter at each of the river stations. The average BOD loads in pounds per day carried by the river during the two studies are presented in Chart 7.

That is this visual chart here. Again the open columns to the left represent the results obtained during the September study; the colored columns indicate the results obtained during the November study. The figures at the top of the column indicate the thousands of pounds of BOD carried by the river at these various points during each of the studies.

BOD data on each plant waste in Table 5 includes the concentration in milligrams per liter, pounds per day, population equivalents, and pounds of BOD per ton of beets processed.



B.O.D., MG / L
NORTH PLATTE RIVER SURVEY
WYOMING - NEBRASKA
SEPTEMBER & NOVEMBER
CHART 6



B.O.D. LBS. PER DAY (IN THOUSANDS)
NORTH PLATTE RIVER SURVEY
WYOMING – NEBRASKA
SEPTEMBER & NOVEMBER

CHART - 7

During November at the Torrington Station (NP-208.8), above the sources of wastes considered, the BOD averaged 1.0 milligrams per liter and the load amounted to 1,710 pounds per day. The load was 41 percent of the September load in the river. This indicates the reduced irrigation return loads during November.

Immediately below the Torrington Bridge Station, the Holly Torrington plant discharged its wastes (HT-208.8). The BOD discharged during the 4-day sampling period averaged 1,360 milligrams per liter or 103,000 pounds per day, at an average flow of 14.11 cubic feet per second. The total calculated load in the river immediately below this discharge was 104,700 pounds per day or 61 milligrams per liter.

At Henry (NP-199.0) the average BOD concentration was 48.4 milligrams per liter and the load 82,200 pounds per day. This represents an average reduction of 22,500 pounds of BOD between the point of waste discharge and Henry.

At Mitchell (NP-184.0) the average load was 53,500 pounds of BOD per day and the concentration 20.0 milligrams per liter. Approximately 97 percent of this amount, or 52,000 pounds, was residual BOD from the Torrington Holly plant.

At the Scottsbluff-Gering Bridge the BOD load was 51,500 pounds per day and the concentration 15.4 milligrams per liter. Calculations based on a deoxygenation coefficient of 0.42 indicate that about 15,500 pounds of BOD settled to the bottom of the river between the Mitchell Bridge and the Scottsbluff-Gering-Terrytown Bridge. This represented about 23 percent of the residual BOD at the Scottsbluff-Gering-Terrytown Bridge Station. Assuming that the BOD from above Mitchell settled proportionately, the residual quantity was 31,500 pounds. About 30,500 pounds of this BOD originated at the Holly Torrington plant.

In the Scottsbluff-Gering-Terrytown Area an additional load of 124,000 pounds per day of BOD was discharged to the river. The Great Western plant at Scottsbluff contributed 99,000 pounds, and the Gering plant 16,500 pounds per day. The remaining 8,500 pounds were contributed by the other wastes from this area. The total load being carried by the river below the bridge was calculated to be 175,000 pounds per day. With an average flow of 627 cubic feet per second, the calculated concentration was 52 milligrams per liter.

At the Minatare Station (NP-166.0) the average BOD concentration was 33.9 milligrams per liter and the load

132,700 pounds per day. The McGrew Bridge Station (NP-160.2) had a concentration of 27.6 milligrams per liter and a load of 120,000 pounds. At the Bayard Bridge (NP-154.6) these figures were 21.8 milligrams per liter or 104,200 pounds.

The Bayard plant wastes were discharged below the Bayard Bridge and upstream from the Belmont Diversion Dam (NP-149.8). The BOD concentration at the dam was 19.4 milligrams per liter and the load 99,600 pounds per day. Though there was a decrease in the BOD load, the rate of decrease was somewhat less than upstream. Part of the apparent decrease in rate was due to the load discharged from the Bayard Plant broad-field irrigation system. In addition, the actual deoxygenation rate decreased in this section of the river.

By the use of formulae included in Appendix B, the BOD remaining from any source can be calculated at any downstream point within the reach of the river studied. These calculated results are presented in Table 7 for BOD loads greater than 1,000 pounds per day.

Table 7 includes the seven sources of the BOD loads that equaled 1,000 pounds per day and their residuals at various points at the stations investigated downstream.

During the November study a total of 267,000 pounds per day of 5-day 20-degree Centigrade Biochemical Oxygen Demand were discharged to the North Platte River between Torrington, Wyoming, and Broadwater, Nebraska. Of this amount, the five beet sugar plants discharged 255,700 pounds and the remaining sources of waste accounted for 11,300 pounds. 103,000 of the 255,700 pounds were discharged from the one beet sugar plant in Wyoming. 152,700 pounds were discharged in the combined wastes of the four sugar plants in Nebraska. Of the remaining 11,300 pounds, approximately 9,000 pounds were discharged from the Scottsbluff-Gering Area.

Bacteriological examination of stream and waste samples included determination of bacteria of the coliform group, fecal coliform, and fecal streptococci. The purpose and procedure of each of the bacteriological tests performed is included in Appendix C under the heading, "Bacteriological Examination of Stream Samples."

Chart 8 presents the procedures used during the September and November studies. Individual results obtained on each daily sample are included in Appendix A. Average

NORTH PLATTE RIVER SURVEY

Wyoming-Nebraska

September and November 1961

TABLE No. 7

SOURCES OF WASTE

BOD-Residuals (of Sources Greater than 1,000 Lbs/day)

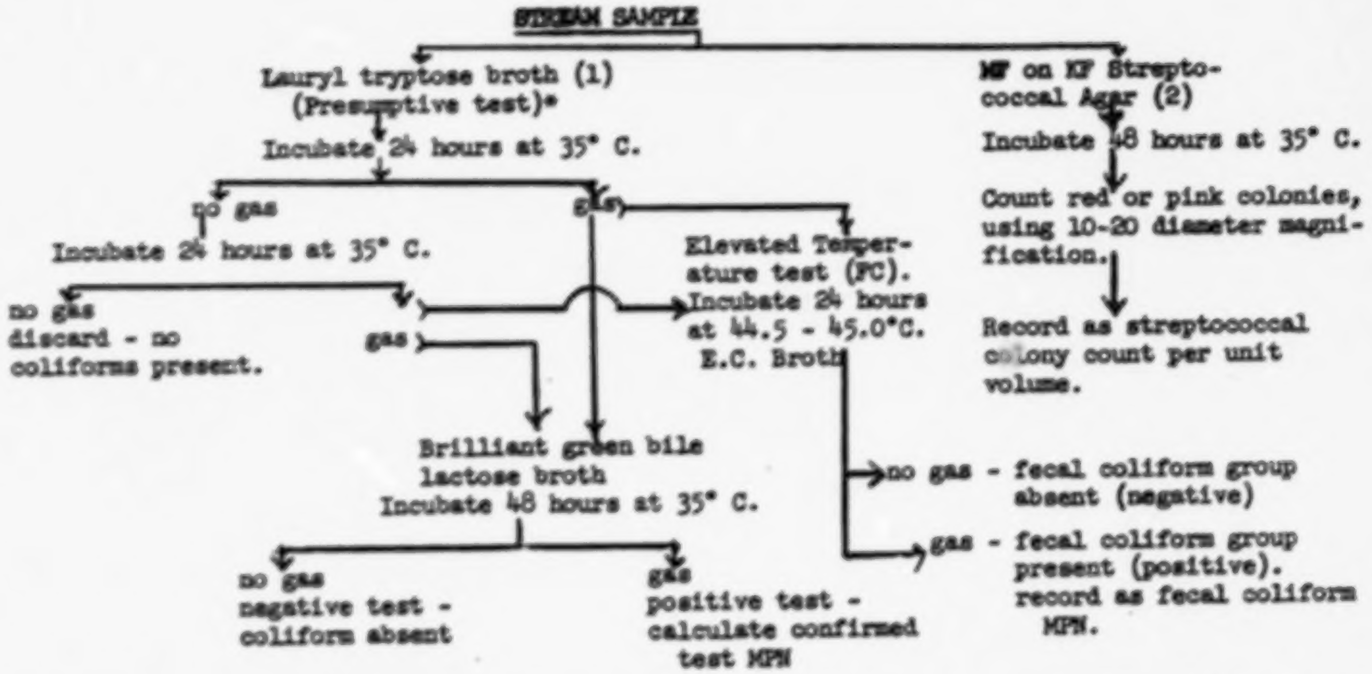
BOD in Lbs/day Remaining At Station	*Holly Sugar	*Gr.West. Mitchell Plant	Scotts-bluff Munic. Waste	Gering Munic. Waste	*Gr.West. Scotts-bluff Plant	*Gr.West. Gering Plant	Gr.West. Bayard Plant	Total Load in River
* (HT-208.8)	*103,000							104,700
(NP-199.0)	81,000							82,200
(NP-191.6)	57,000							58,000
(NP-184.0)	52,500							53,500
*(GM-184-1.5)		*35,000						88,000
(NP-180.5)	45,000	29,700						75,000
(NP-177.3)	37,000	24,400						61,500
(NP-173.8)	30,500	20,500						51,500
Scottsbluff Municipal			3,000					-
Gering Municipal				6,000				-
*(GS-173.8-3.0)					99,000			-
*(GG-173.0-1.5)						*16,400		176,000
(NP-166.0)	24,800	16,600	2,400	4,800	80,000	13,000		132,700
(NP-160.2)	21,200	14,000	2,000	4,150	68,000	11,000		120,000
(NP-154.6)	18,200	12,200	1,790	3,580	59,000	9,800		104,200
(GB-150.0-2)							9,200	-
(NP-149.8)	17,300	11,200	1,650	3,300	54,500	9,050	9,200	99,600
(NP-141.8)	15,200	9,850	1,450	2,900	48,000	7,950	7,450	97,600
(NP-127.0)	12,000	7,100	1,130	2,260	37,200	6,200	5,800	76,000

* Loads from field data.

NORTH PLATTE RIVER SURVEY
Wyoming-Nebraska
September and November 1961

CHART No. 8

BACTERIOLOGICAL EXAMINATION OF STREAM SAMPLES


STREAM SAMPLE
Lauryl tryptose broth (1)
(Presumptive test)*
Incubate 24 hours at 35° C.
no gas
Incubate 24 hours at 35° C.
no gas
discard - no
coliforms present.
gas
gas
Brilliant green bile
lactose broth
Incubate 48 hours at 35° C.
no gas
negative test -
coliform absent
gas
positive test -
calculate confirmed
test MPN
Elevated Temperature test (FC).
Incubate 24 hours
at 44.5 - 45.0°C.
E.C. Broth
no gas - fecal coliform group
absent (negative)
gas - fecal coliform group
present (positive).
record as fecal coliform
MPN.
MF on KF Streptococcal Agar (2)
Incubate 48 hours at 35° C.
Count red or pink colonies,
using 10-20 diameter magnification.
Record as streptococcal
colony count per unit
volume.

* Indicates procedure described as standard test in Standard Methods for the Examination of Water and Wastewater, 11th ed. (1960).

(1) Lactose broth may be substituted for lauryl tryptose broth.
(2) The KF Agar pour plate count may be used interchangeably with the MF colony counting technique.

Produced by: Microbiology Section
Research Branch
WSPC

bacteriological results for each of the stations are summarized in Table 8.

Table 8 presents the average results for the coliform group in most probable numbers (MPN) per 100 milliliters in thousands. These data are also presented in Bacterial Quantity Units and Bacterial Population Equivalents. The Bacterial Quantity Units (B.Q.U.) represent the number of bacteria that will pass any given point on a stream in one day. One B.Q.U. equals 2.45 times 10 and a twelfth, or 2 trillion 450 billion, bacteria going by a point in a 24-hour period. Bacterial Population Equivalents were calculated on the basis of the maximum coliform contribution per capita at the peak of the coliform growth curve.

Table 8 includes data on fecal coliform MPN per 100 milliliter in thousands, and B.Q.U. Units. Streptococci is recorded as FS per 100 milliliter and in B.Q.U. Units.

Average bacterial results of each of the river stations are presented in Charts 9 through 14. Chart 9 presents the total coliform in MPN per 100 milliter; Chart 10 the total coliform in B.Q.U. Units.

That is this chart here. Again the open columns to the left represent the data collected at each of these stations during the September 1961 study. The colored bars indicate the results obtained during the November study. Each of these figures at the top of the column indicate in bacterial quantity units the number of bacteria that would pass that station in a 24-hour period. The number at the top of the column would be multiplied to obtain the actual count of bacteria by 2.45 times 10 and a twelfth.

Chart 11 presents the fecal coliform in MPN per 100 milliliter; Chart 12 fecal coliform in B.Q.U. Units. Chart 13 presents the streptococci bacteria in density per 100 milliliter; Chart 14 the streptococci in B.Q.U. Units.

Coliform content of the North Platte at the Torrington Station (NP-208.8) was relatively low during September and November. In September the concentration was 800 coliform per 100 milliliter, and in November 70 coliform per 100 milliliter. The higher figure in September was probably due to irrigation return water.

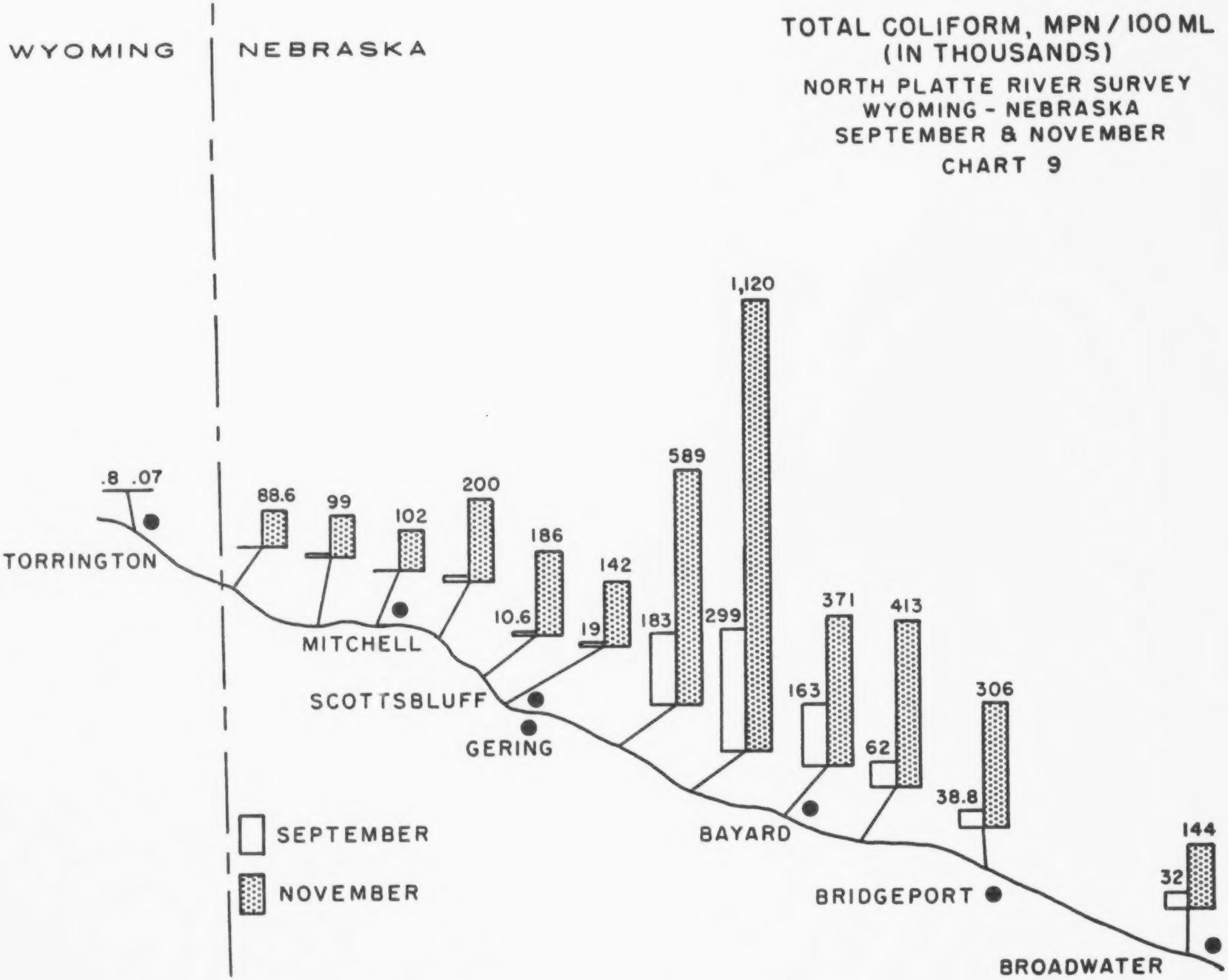
At the Henry Station (NP-199.0), below the Holly

NORTH PLATTE RIVER SURVEY
WYOMING-NEBRASKA
SEPTEMBER-AND NOVEMBER 1961

SUMMARY BACTERIOLOGICAL DATA TABLE No. 8

Station	Flow	(Cfs)	TOTAL COLIFORM						FECAL COLIFORM				FECAL STREP			
			SEPTEMBER			NOVEMBER			SEPTEMBER		NOVEMBER		SEPTEMBER		NOVEMBER	
	SEPT.	NOV.	MPN/100ml (in thous.)	BQU(3)	BPE(4)	MPN/100 ml (in thous.)	BQU(3)	BPE(4)	MPN/100ml (in thous.)	BQU(3)	MPN/100ml. (in thous.)	BQU(3)	FS/100 ml (in thous.)	BQU(3)	FS/100 ml (in thous.)	BQU(3)
NP 208.8	528	317	.8	4	103	.07	.22	5.4	< .44	< 2.3	.04	.12	.032	.17	.17	.54
NP 199.0	528	317	2.6	14	336	88.6	280	6,880	< .35	< 1.8	4.73	15	.146	.77	1,477	4,680
(1)HC 194-1	56	27	10	6	137	14.7	4	97	3.7	2.0	3.3	.89	1.6	.90	38	10
NP 191.6	171	406	11.2	19	469	99	402	9,850	1.9	3.2	2.1	8.5	1.1	1.9	704	2,860
NP 184.0	212	497	7.9	17	410	102	507	12,420	2.7	5.7	2.4	12	.74	1.6	264	1,310
NP 180.5	284	541	20.2	57	1,400	200	1,080	26,510	6.4	18	15.2	82	.8	2.3	301	1,630
NP 177.3	324	582	10.6	34	841	186	1,080	26,520	1.3	4.2	5.4	31	1.0	3.2	208	1,210
NP 173.8	367	627	19	70	1,710	142	890	21,810	2.9	10.6	8.0	50	1.4	5.1	278	1,740
NP 166.0	462	726	183	845	20,700	589	4,280	104,770	38.5	178	39	283	5.6	26	1,625	11,800
NP 160.2	585	807	299	1,750	42,900	1,119	9,030	221,240	37.0	216	27.7	224	5.8	34	1,189	9,600
NP 154.6	665	884	163	1,080	26,600	371	3,280	80,350	50.0	333	48.0	424	5.5	37	579	5,120
NP 149.8	733	951	62	454	11,100	413	3,930	96,230	14.8	108	23.0	219	2.7	20	406	3,860
(1)RW 149.3-0.5	145	72	38.8	56	1,400	15.7	11	277	12.5	18	6.2	4.5	6.1	8.8	12.6	9.1
NP 141.8	843	1062	38.8	327	8,000	306	3,250	79,620	8.9	75	16.2	172	3.0	25	280	2,970
NP 127	1,050	1267	32	336	8,200	144	1,820	44,700	1.7	18	4.7	60	9.5	100	63.3	802
(2)GG 173-1.5	0.55	10.96	251	1.4	34	11,601	1,270		194.5	1.1	193	21	73	.40	40,121	4,400
(2)HT 208.8	-	14.05	-	-	-	7,039	989		-	-	89	12	-	-	132,692	18,700
(2)GM 184-1.5	-	9.85	-	-	-	50,057	4,930		-	-	1,548	152	-	-	8,321	820
(2)GS 173.8-1.5	-	13.14	-	-	-	3,307	435		-	-	159	21	-	-	20,241	2,660
(2)GB 150-2.5	-	8.0	-	-	-	8,141	651		-	-	70.4	5.6	-	-	16,000	1,280
(2)GB 150-2.0	-	2.4	-	-	-	1,928	46		-	-	20.0	.48	-	-	1,444	36

(1) Tribntary Stations.
(2) Beet Sugar Plant Waste Ditch Stations.
(3) Bacterial Quantity Units (BQU) = $\frac{\text{Bacteria/100 ml x flow (CFS)}}{10^5}$
(4) BPE(Bacteria) Population Equivalent) - Based on Temperatures of Less than 15°C.-BPE = Flow(CFS) x MPN/100 ml x 2.45×10^{-4}.



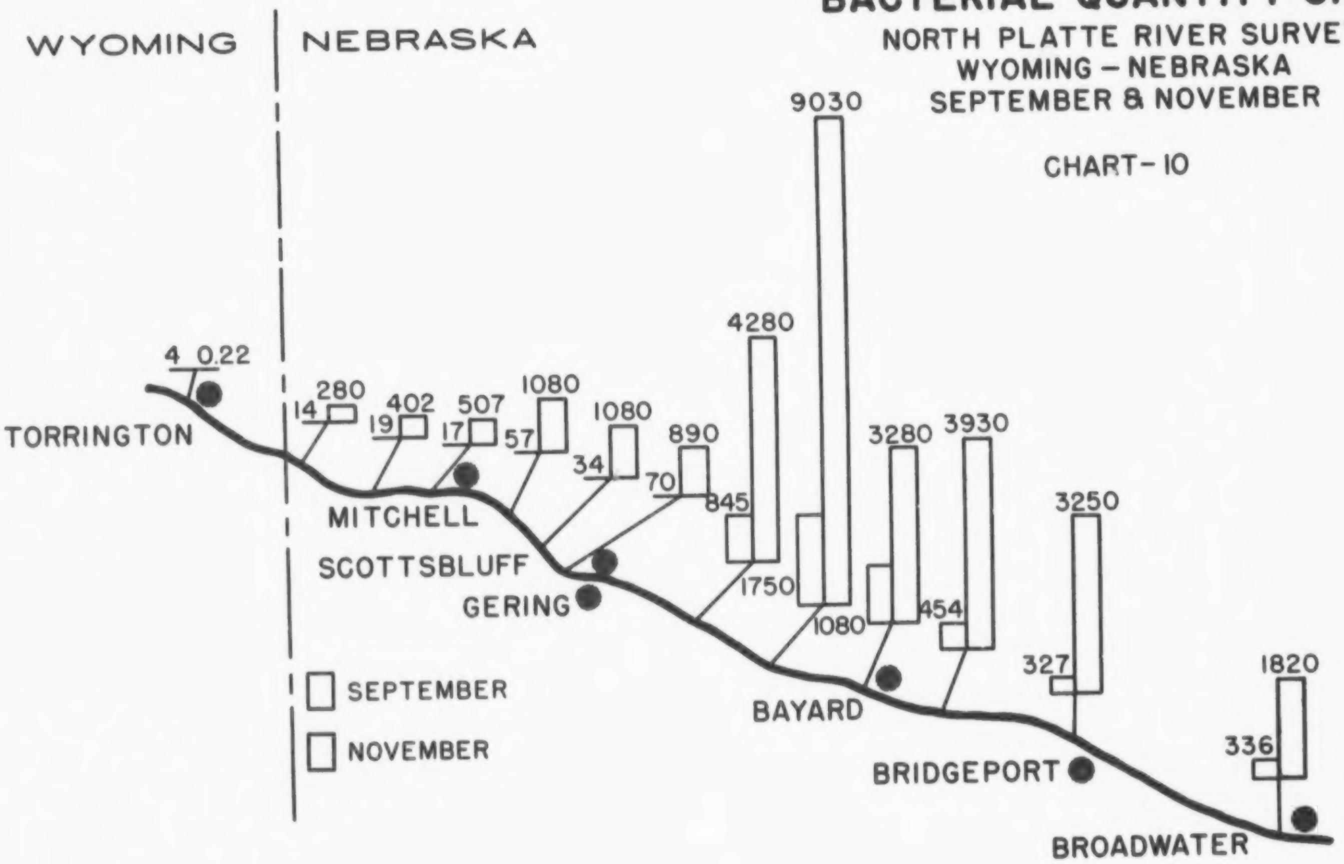
TOTAL COLIFORM, MPN / 100 ML
(IN THOUSANDS)

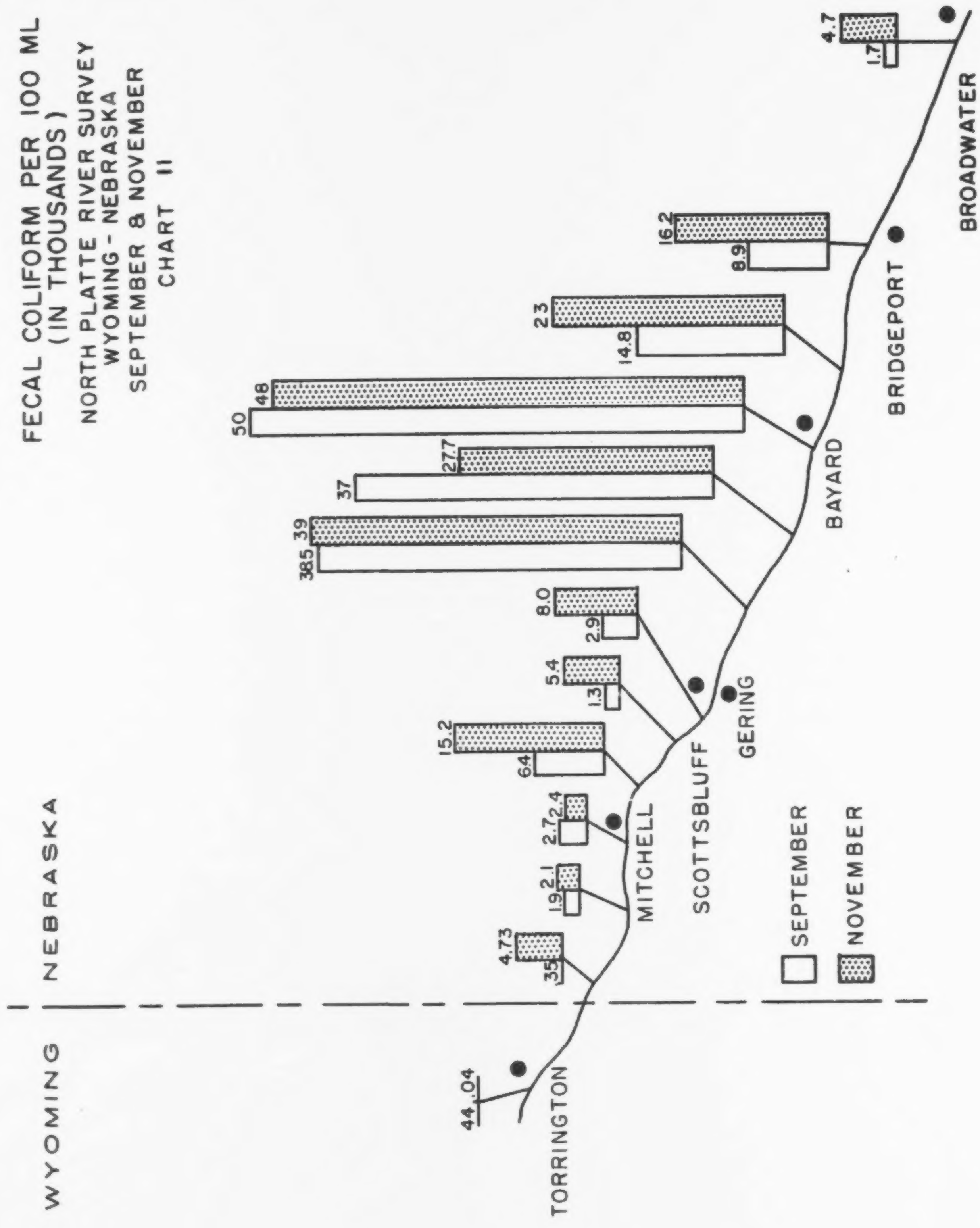
NORTH PLATTE RIVER SURVEY
WYOMING - NEBRASKA
SEPTEMBER & NOVEMBER
CHART 9

TOTAL COLIFORM BACTERIAL QUANTITY UNITS

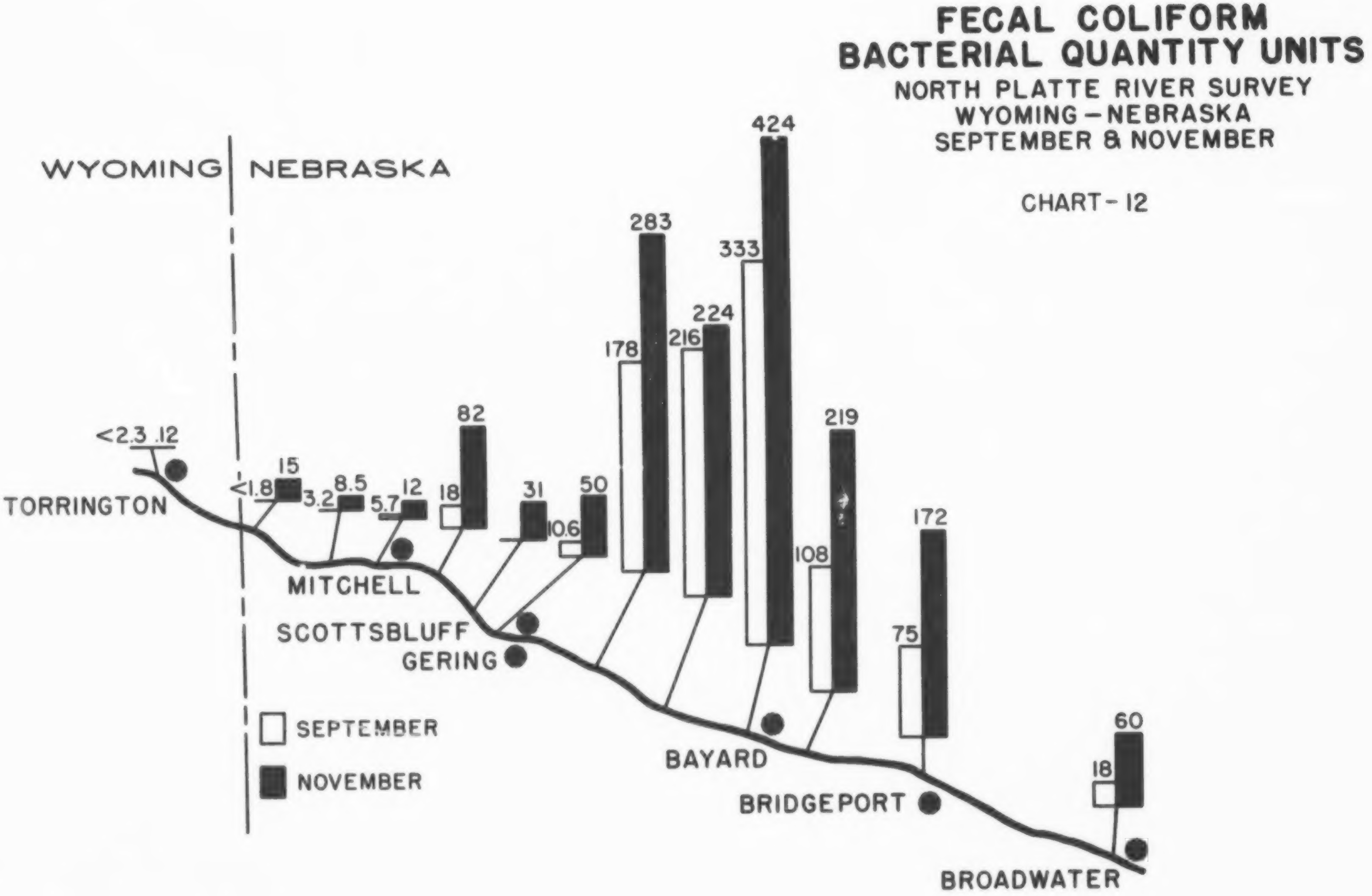
NORTH PLATTE RIVER SURVEY
WYOMING – NEBRASKA
SEPTEMBER & NOVEMBER

CHART- 10



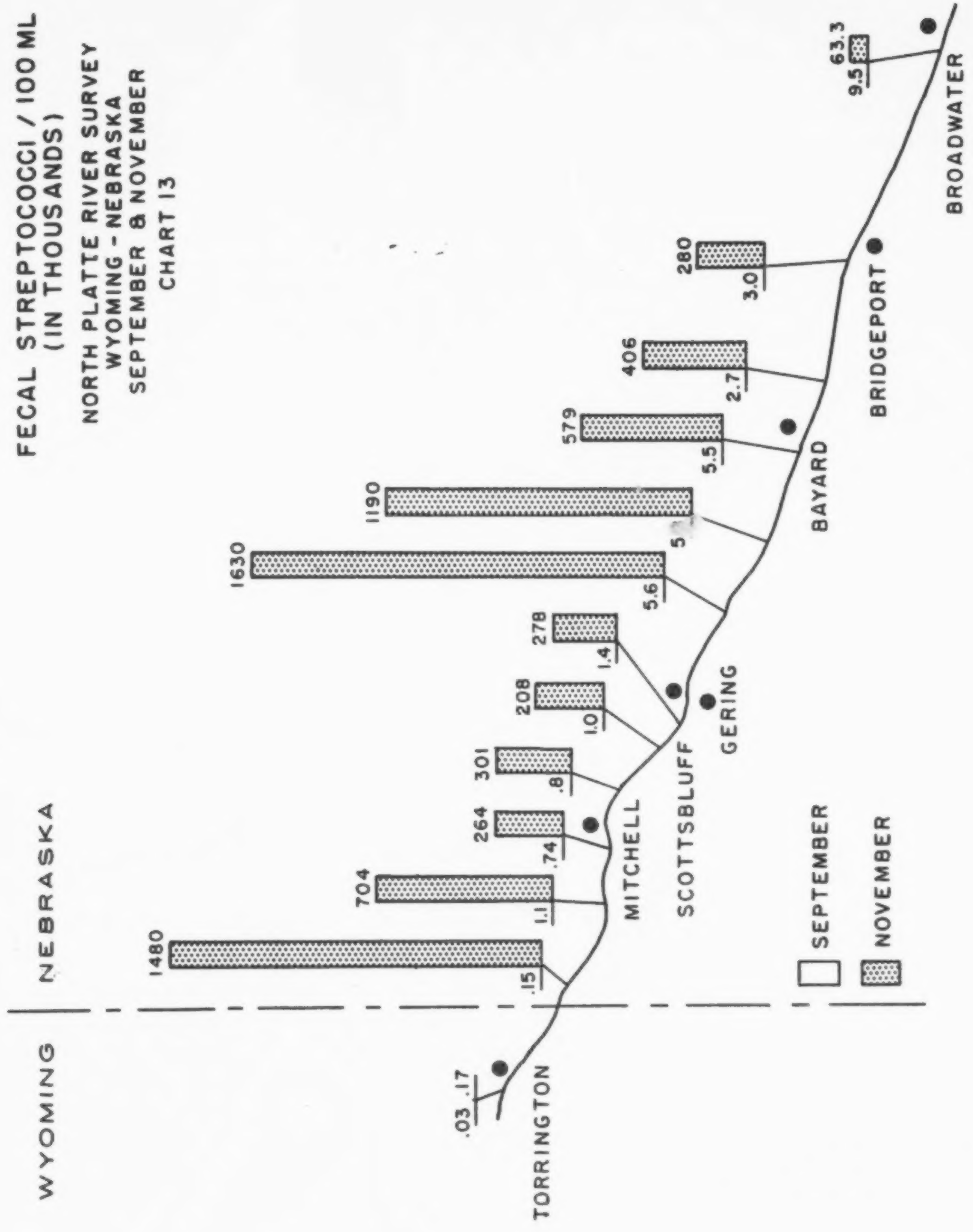


FECAL COLIFORM PER 100 ML
(IN THOUSANDS)
NORTH PLATTE RIVER SURVEY
WYOMING - NEBRASKA
SEPTEMBER & NOVEMBER
CHART II



FECAL COLIFORM
BACTERIAL QUANTITY UNITS
NORTH PLATTE RIVER SURVEY
WYOMING – NEBRASKA
SEPTEMBER & NOVEMBER

CHART - 12

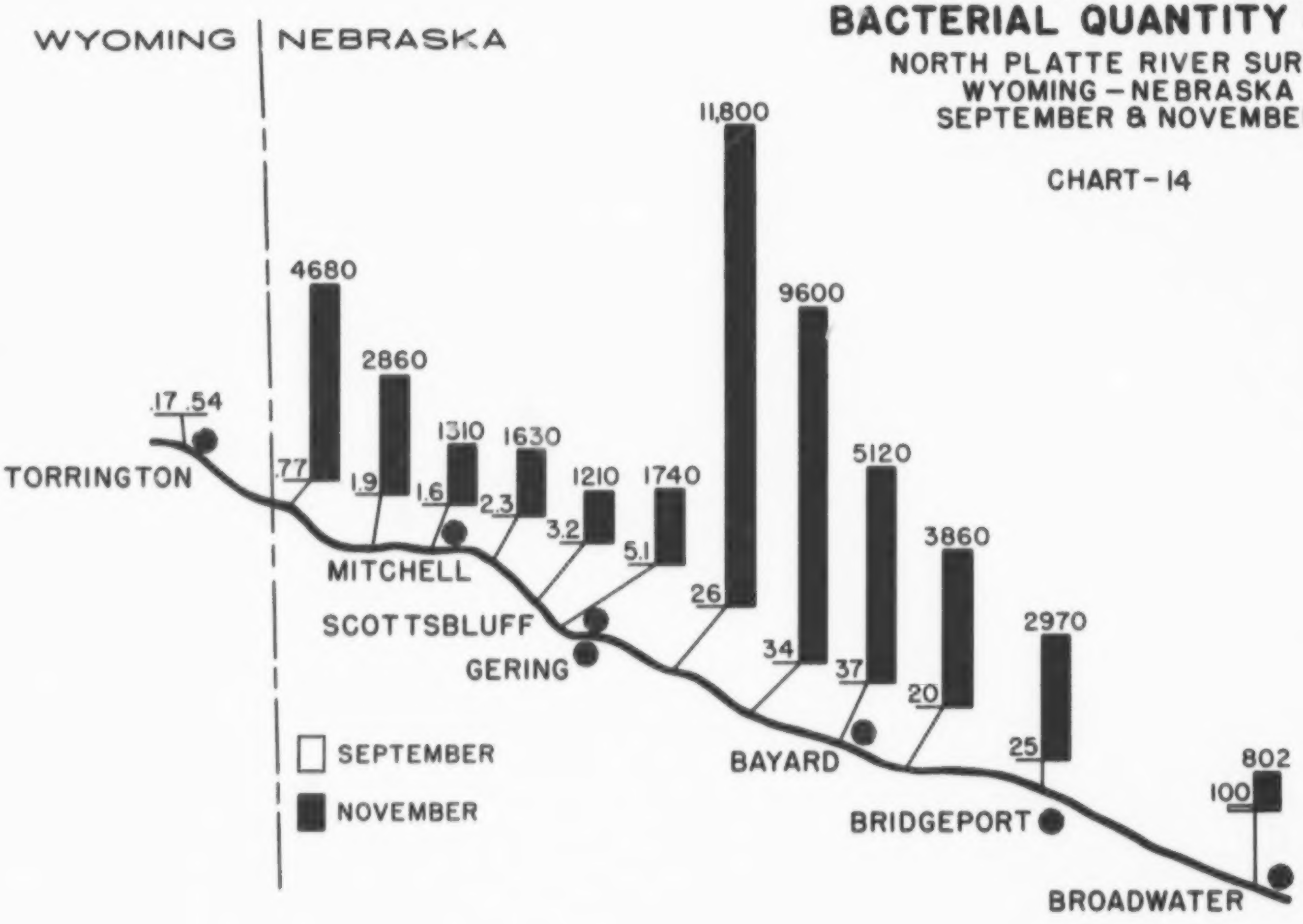


FECAL STREPTOCOCCI / 100 ML
(IN THOUSANDS)

NORTH PLATTE RIVER SURVEY
WYOMING - NEBRASKA
SEPTEMBER & NOVEMBER
CHART 13

FECAL STREPTOCOCCI
BACTERIAL QUANTITY UNITS
NORTH PLATTE RIVER SURVEY
WYOMING – NEBRASKA
SEPTEMBER & NOVEMBER

CHART – 14



Sugar plant waste discharge, there was a thousandfold increase during November as compared to a 3.5-fold increase in September over the content at the Torrington station.

Horse Creek (HC-194-1), a tributary receiving the untreated wastes of Lyman, contributed approximately one third of the total coliform at Morrill during September, while in November the contribution amounted to one percent.

At Station 6 (NP-180.5), below the discharge of Mitchell sewage and Great Western's Mitchell plant, there was a marked increase both during September and November. In September the increase was from 7,900 above the wastes to 20,200 per 100 milliliter, and in November from 102,000 to 200,000 per 100 milliliter.

At the Minatare Station (NP-166.0), the first station below the Scottsbluff-Gering Area, a sharp increase occurred in densities during both studies. In September the MPN per 100 milliliter was 183,000. In November there were 589,000 per 100 milliliter. At McGrew (NP-160.2) the density continued to increase to 299,000 per 100 milliliter during September. The highest average recording during November also occurred at McGrew. Most probable number per 100 milliliter was 1,120,000.

The average values at the McGrew Bridge represent a 400-fold increase in September and a 40,000-fold rise in November over the average values at the Torrington Station (NP-208.8).

Below the McGrew Bridge the densities dropped during the September study through the remainder of the reach studied. During November there was a drop from 1,120,000 coliforms per 100 milliliter at the McGrew Bridge to 371,000 per 100 milliliter at the Bayard Bridge (NP-154.6). However, there was an increase to 413,000 per 100 milliliter at the Belmont Diversion Dam (NP-149.8) below the Bayard Plant waste. Below the Belmont Dam the densities decreased to 144,000 per 100 milliliter at the Broadwater Station.

Red Willow Creek (RW-149.3-0.5) at the point sampled included the sewage discharged by the Bayard municipal system. The average total coliform at that station during September was 38,800 per 100 milliliter and during November 15,700 per 100 milliliter. The decrease was probably due to the lower temperatures of November and the reduced irrigation activities.

The five beet sugar plants contributed a total of 7,670 B.Q.U. to the river. The Torrington plant contributed 989 B.Q.U., the Mitchell plant 4,930 B.Q.U., the Scottsbluff plant 435 B.Q.U., the Gering plant 1,270 B.Q.U., and the Bayard plant 46 B.Q.U.

There was only a slight increase in fecal coliform densities at the various river stations during the November study as compared to the September data. Densities of less than 440 fecal coliforms per 100 milliliter in September and 40 per 100 milliliter in November were recorded at the Torrington Station. In November the densities at Henry increased to 4,730 per 100 milliliter, while in September there was a drop to less than 350 MPN per 100 milliliter.

Below the Mitchell sewage and the Great Western plant discharge the density was 6,400 MPN per 100 milliliter with 18 B.Q.U. in September and 15,200 MPN per 100 milliliter with 82 B.Q.U. in November.

Peak densities were recorded at the Bayard Bridge Station (NP-154.6) for both studies. For September there were 50,000 fecal coliform per 100 milliliter or 333 B.Q.U. During November there were 48,000 MPN per 100 milliliter and 424 B.Q.U. The higher B.Q.U. in the river during November indicates a definite contribution of fecal coliform from the beet sugar plants.

Fecal coliform densities in Horse Creek below Lyman wastes were 3,700 per 100 milliliter during September and 3,300 per 100 milliliter during November. The B.Q.U. dropped from 2.0 during September to 0.89 during November.

At the Red Willow Station below the Bayard sewage discharge the fecal coliform dropped from 12,500 MPN per 100 milliliter during September to 6,200 per 100 milliliter during November.

Data obtained from the beet sugar plant waste ditches indicate that a total fecal coliform of 206 B.Q.U. were discharged to the river from the five plants. The Torrington plant discharged 12 B.Q.U., the Mitchell plant 152, the Scottsbluff plant 21, the Gering plant 21, and the Bayard plant 0.48 B.Q.U.

The group of streptococci investigated during the September and November studies are always found in feces. Fecal

Streptococci, like fecal coliform, are interpreted to indicate fecal pollution.

At the Torrington Station (NP-208.8) densities were quite low at 32 streptococci per 100 milliliter and 170 streptococci per 100 milliliter during September and November, respectively.

At Henry (NP-199.0) the density was 146 streptococci per 100 milliliter in September and in November 1,480,000 streptococci per 100 milliliter. This represents a density increase of 10,000 times between September and November.

During the September study the densities increased from Henry to the Scottsbluff-Gering Bridge, where the density was 1,400 streptococci per 100 milliliter. During November densities dropped in this section to a minimum of 208,000 per 100 milliliter at the 20th Street Bridge (NP-177.3) and then increased to 278,000 per 100 milliliter at the Scottsbluff-Gering Bridge (NP-173.8).

Below the Scottsbluff-Gering-Terrytown Area sharp increases occurred during September and November. During September a density of 5,800 streptococci per 100 milliliter occurred at the McGrew Bridge (NP-160.2). During November the maximum density of 1,630,000 streptococci per 100 milliliter occurred at Minatare.

During September densities dropped from the maximum at McGrew to the Bridgeport Station below the confluence with Red Willow. At the Bridgeport Station there were 3,000 streptococci per 100 milliliter. At the Broadwater Station below Bridgeport wastes there were 9,500 streptococci per 100 milliliter.

In November streptococci densities dropped at each of the downstream stations from the maximum at Minatare to 63,300 per 100 milliliter at the Broadwater Station (NP-127.0).

The Holly Sugar Company plant at Torrington contributed 18,700 B.Q.U. of streptococci with 133,000,000 per 100 milliliter to the river; the Mitchell plant 820 B.Q.U. with 8,320,000 per 100 milliliter; the Scottsbluff plant 2,660 B.Q.U. with 20,200,000 per 100 milliliter; the Gering plant 4,400 B.Q.U. with 40,100,000 per 100 milliliter; and the Bayard plant 36 B.Q.U. with 1,440,000 per 100 milliliter.

Total and volatile suspended solids data were collected during the September and November studies. Results of individual samples are recorded in Appendix A. Average results of the individual stations for September and November are presented in Table 4.

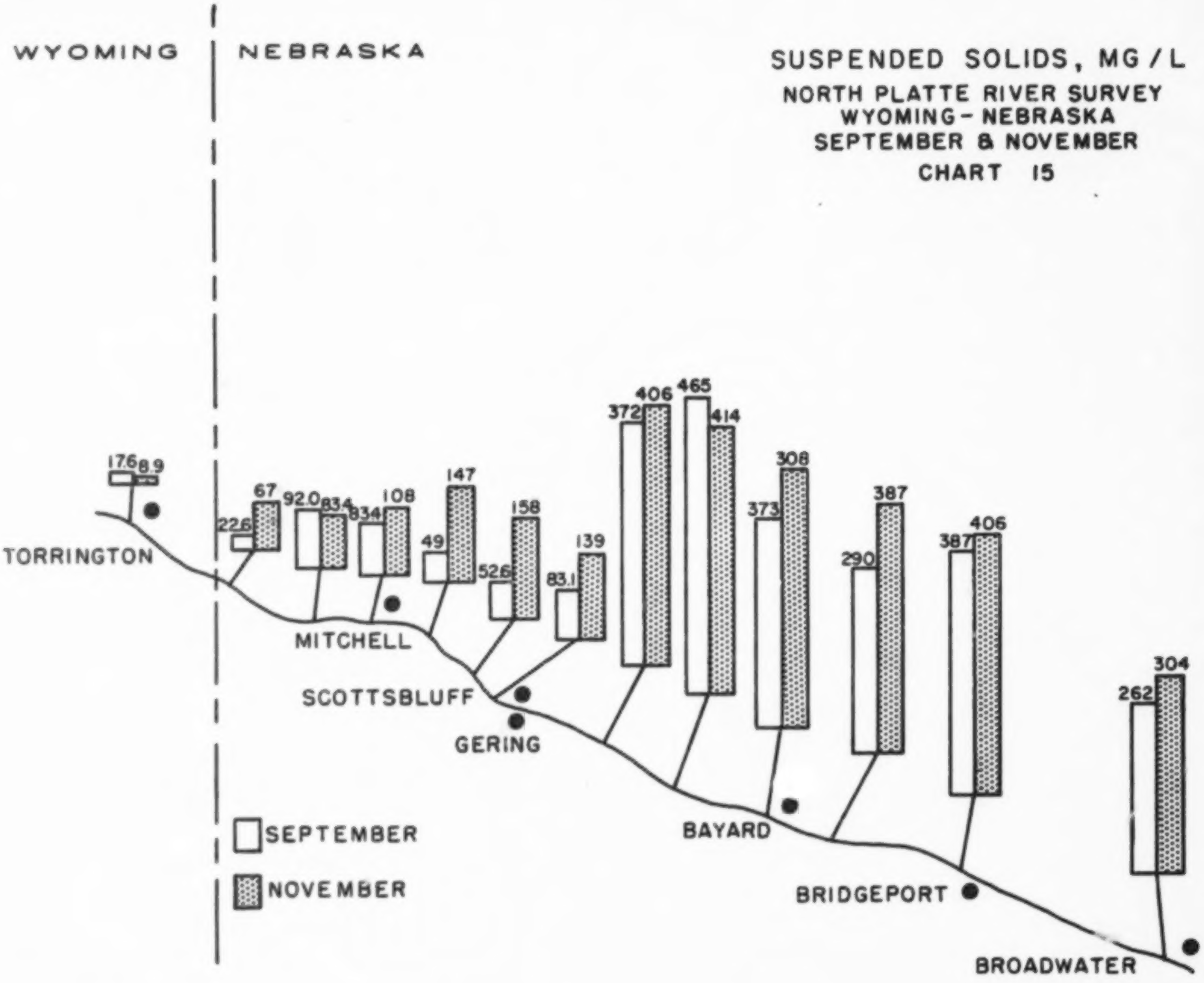
Chart 15 presents average concentrations at each of the river stations in milligrams per liter of suspended solids for September and November. Chart 16 presents the load in pounds per day at each of the river stations during the two studies.

Chart 16 is the visual chart here with, again, the open columns to the left for September, the colored columns to the right for November. The numbers at the top of the columns represent the suspended solids in pounds per day and in thousands. In other words, these figures represent in thousands of pounds the loads being carried by the river at that particular point during the two studies.

During the initial study the load carried by the river increased from a load of 50,200 pounds per day at Torrington to a load of 95,400 pounds per day at the Mitchell Bridge Station (NP-184.0). The increase between stations where wastes are not known to enter indicates the source of the additional load to be the irrigation return water. Below the Mitchell Station the load dropped to 75,000 pounds per day at Station 6 (NP-180.5). From this point the load increased to the McGrew Bridge Station with a sharp rise at the first station below the Scottsbluff-Gering-Terrytown Area. From the Scottsbluff-Gering Bridge to Minatare there was an increase from 164,500 pounds to 926,000 pounds per day. At Bridgeport (NP-141.8) the concentration and load was at the highest point in the reach studied during September. The average concentration was 387 milligrams per liter, and the average load 1,760,000 pounds or 880 tons of suspended solids per day.

During November the concentration and load at the Torrington Station was 8.9 milligrams per liter and the load 15,200 pounds per day. The concentration and load increased to 108 milligrams per liter and 288,400 pounds per day at the Mitchell Bridge Station. Below Mitchell the concentration and load continued to increase to 158 milligrams per liter and 495,000 pounds per day at the 20th Street Bridge (NP-177.3). At the Scottsbluff-Gering Bridge there was a drop to 139 milligrams per liter and 469,000 pounds per day.

Below the Scottsbluff-Gering-Terrytown Area there

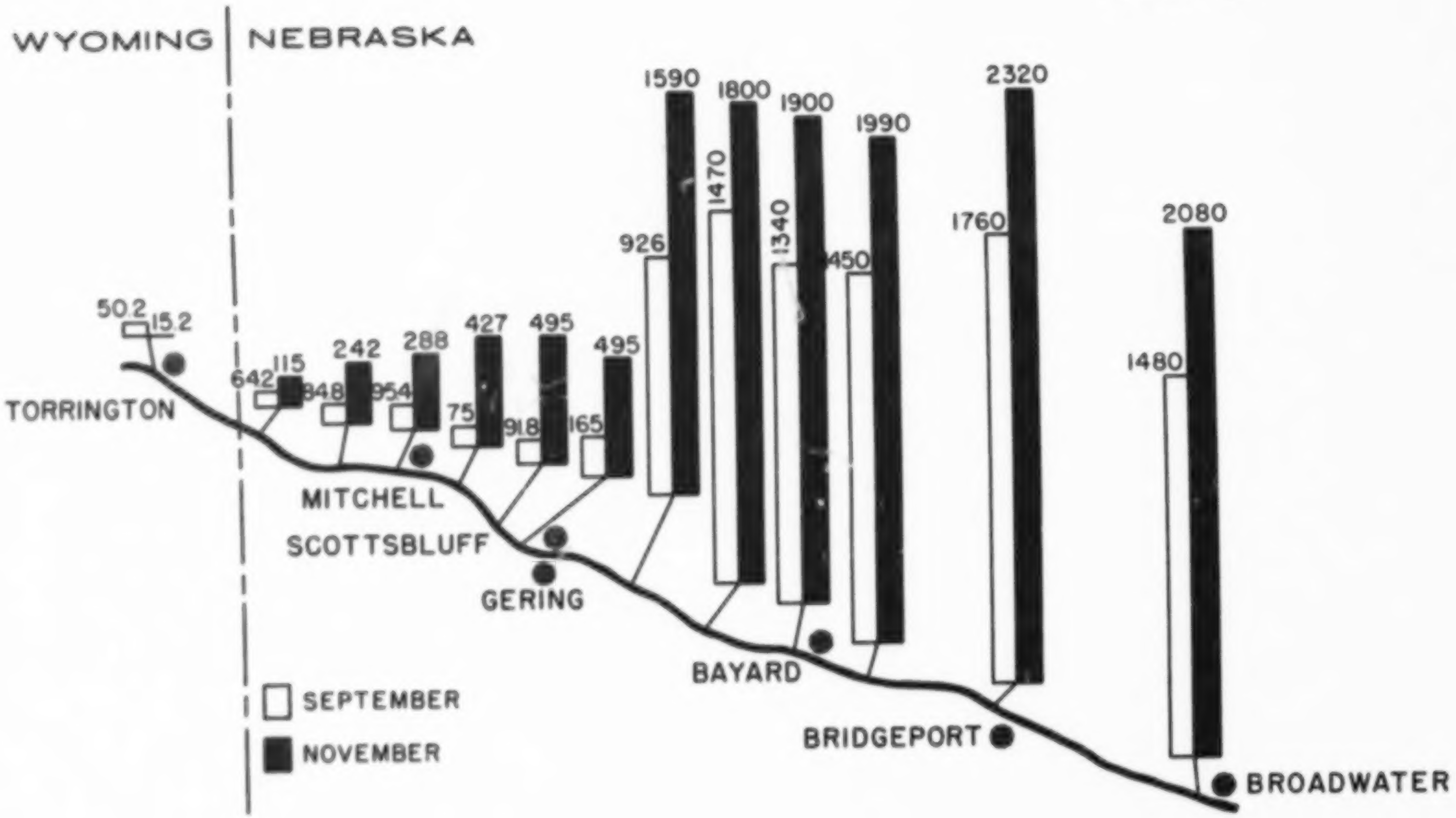


SUSPENDED SOLIDS, MG/L
NORTH PLATTE RIVER SURVEY
WYOMING - NEBRASKA
SEPTEMBER & NOVEMBER
CHART 15

SUSPENDED SOLIDS, LBS./DAY (IN THOUSANDS)

NORTH PLATTE RIVER SURVEY
WYOMING – NEBRASKA
SEPTEMBER & NOVEMBER

CHART - 16



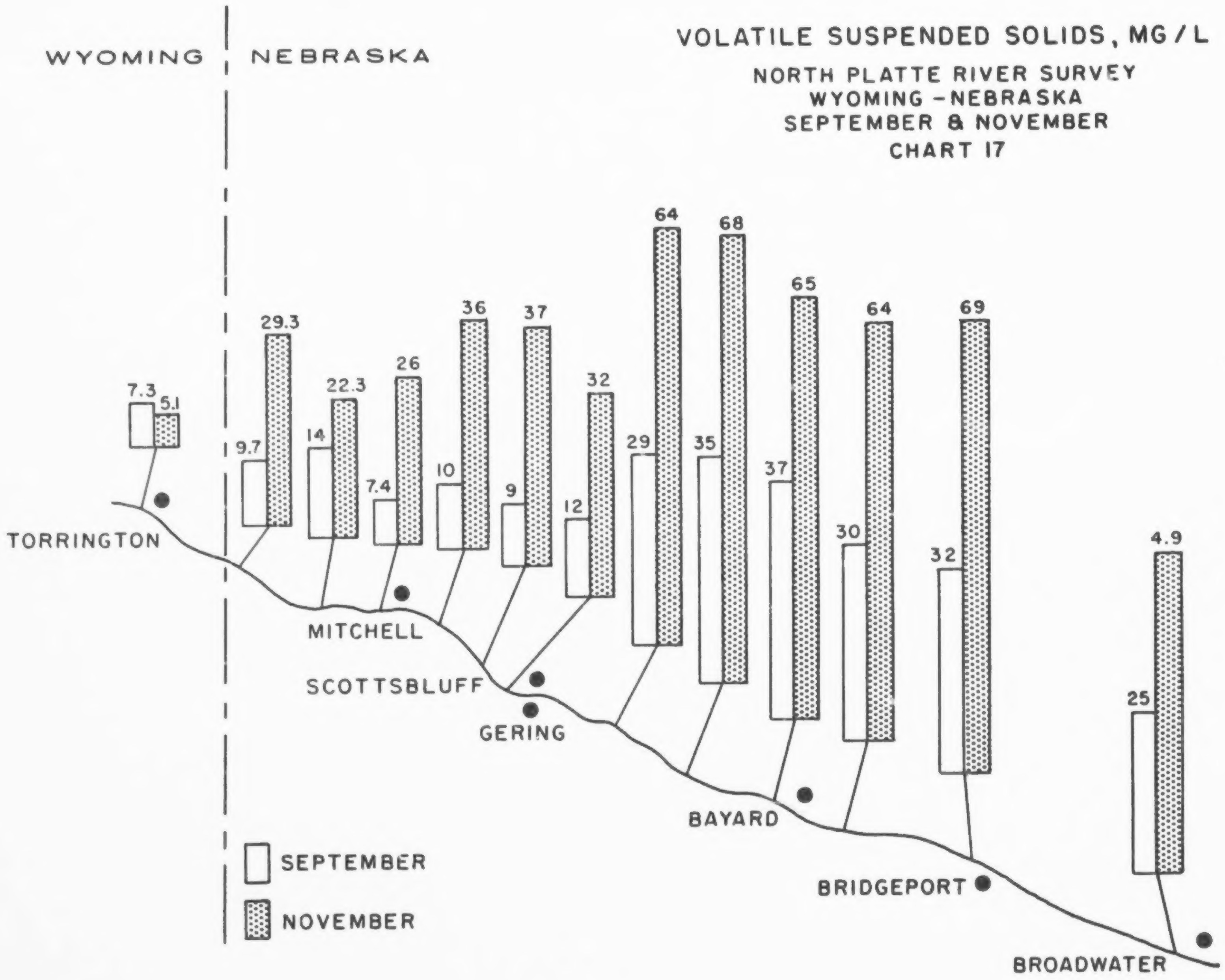
was an increase of over one million pounds per day. At Minatare there were 406 milligrams per liter and 1,590,000 pounds per day of suspended solids in the river. The Gering and Scottsbluff beet sugar plants contributed an average combined load of approximately 600,000 pounds per day. Considering the sharp increase in the load during September and November, there appears to be an unaccounted for load of between 400,000 and 500,000 pounds per day in the Scottsbluff-Gering-Terrytown Area. Computations indicate a source or sources of flow to the river heavily laden with fixed solids.

The suspended solids load in the river continued to increase during November to a maximum load of 2,320,000 pounds or 1,162 tons per day at the Bridgeport Bridge Station (NP-141.8). Below Bridgeport the load dropped to 2,080,000 pounds at Broadwater.

During the November study the five beet sugar plants discharged an average of 983,000 pounds of suspended solids per day. The Torrington plant discharged an average of 108,000 pounds, with 23 percent or 24,700 pounds as volatile suspended solids; the Mitchell plant discharged an average of 274,000 pounds per day, with 17 percent or 46,500 pounds as volatile suspended solids; the Scottsbluff plant discharged an average of 417,000 pounds per day, with 16.4 percent or 67,100 pounds as volatile suspended solids; the Gering plant discharged an average of 184,000 pounds per day, with 10.6 percent or 19,500 pounds as volatile suspended solids; and the Bayard plant discharged an average of 1,860 pounds per day, with 34 percent or 640 pounds as volatile suspended solids.

During September, irrigation activities increased the suspended solids load of the river. The load increased during November between the known sources of wastes. This would indicate that the additional flows picked up in the reach studied contributed to the increased load during both September and November. The increase from the Torrington Station to the maximum point, Bridgeport Bridge, during September amounted to 1,700,000 pounds per day. The increase between these same two points during November amounted to 2,310,000 pounds per day, or 600,000 pounds per day greater than in September. This increase occurred though the irrigation activities were considerably decreased between the September and November study periods.

Chart 17 presents the volatile suspended solids load in milligrams per liter at each of the river stations.



VOLATILE SUSPENDED SOLIDS, MG/L

NORTH PLATTE RIVER SURVEY
WYOMING - NEBRASKA
SEPTEMBER & NOVEMBER
CHART 17

Chart 18 presents the load of volatile suspended solids in pounds per day at each of the river stations.

Chart 18 is the visual chart here, indicating again in thousands of pounds per day the loads carried by the river during the two study periods.

CHAIRMAN STEIN: Mr. Sidio, would you explain for Mr. Samson what you mean by volatile suspended solids, particularly with emphasis on volatile?

MR. SIDIO: Yes. The total suspended solids are calculated by filtering a sample through a filter and that weighed and the total suspended solids determined. This sample is then ignited at a temperature of 600 degrees and again weighed. The remaining, of course, is the non-volatile or the fixed suspended solids. By subtracting that from the total suspended solids, the volatile suspended solids are determined. In other words, it is the suspended solids that will burn off.

CHAIRMAN STEIN: What is the significance from a pollution point of view of volatile suspended solids?

MR. SIDIO: The volatile suspended solids indicate the quantity of volatile--in other words, organic matter present in the stream during that time.

MR. SAMSON: Thank you very much.

CHAIRMAN STEIN: Thank you.

MR. SIDIO: The volatile suspended matter followed the same trend as the total suspended solids. During September the increase from Torrington to the point of maximum load at Bridgeport amounted to 126,000 pounds per day, and in November the increase amounted to 389,000 pounds per day. The increased load of volatile suspended solids in the reach during September amounted to 7.35 percent of the additional load of total suspended solids, and the increase during November amounted to 16.8 percent of the additional suspended solids load. This indicates the increased proportion of organic matter carried in suspension during the November study.

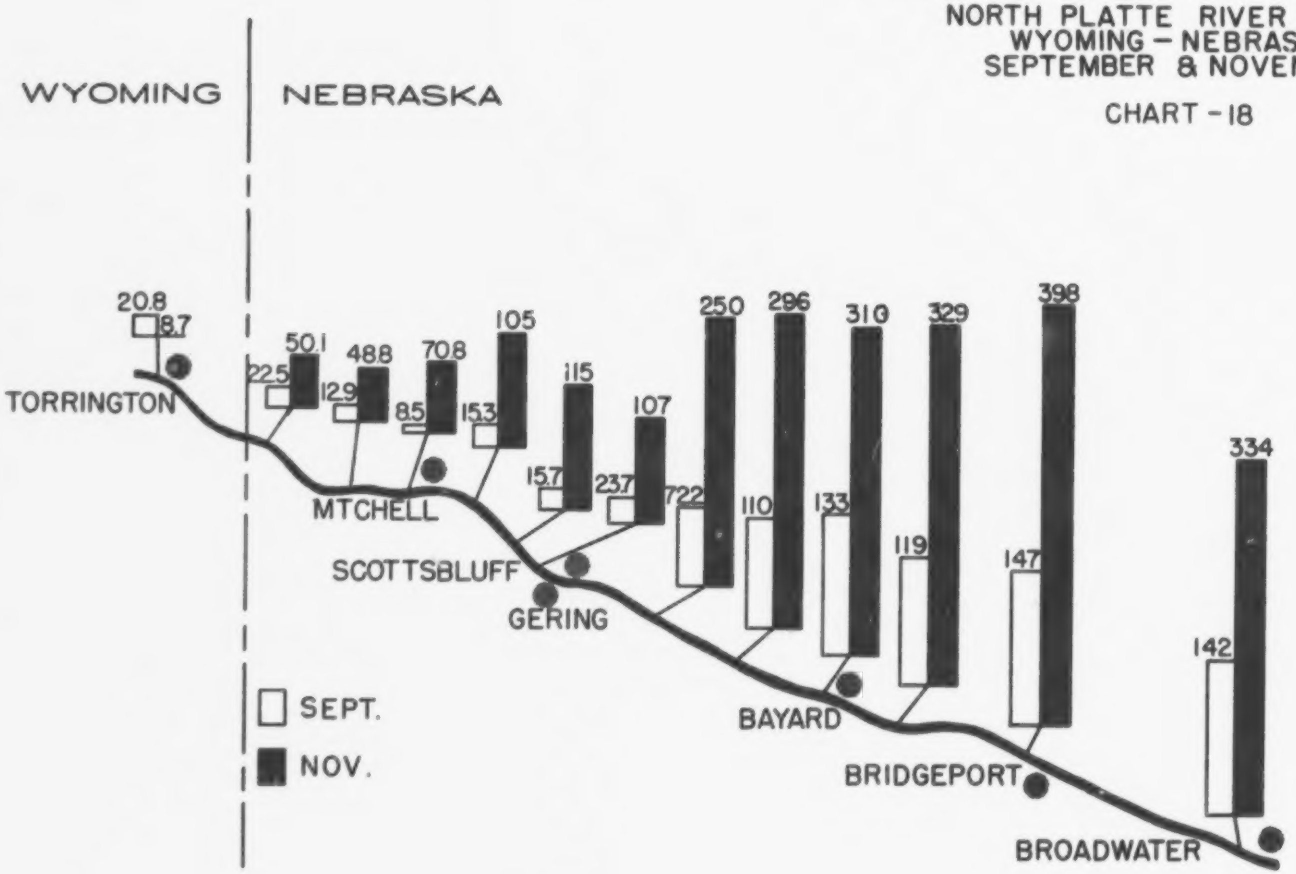
Alkalinity determinations were made on all samples collected--

CHAIRMAN STEIN: Before we go into alkalinity,

VOLATILE SUSPENDED SOLIDS
LBS. PER DAY (IN THOUSANDS)

NORTH PLATTE RIVER SURVEY
WYOMING – NEBRASKA
SEPTEMBER & NOVEMBER

CHART - 18



let's have our coffee break now.

We will stand adjourned for ten or fifteen minutes.

(RECESS)

CHAIRMAN STEIN: May we reconvene, please.

Mr. Sidio.

MR. SIDIO: I would like to continue with the discussion of the results of the analysis made during the September and November 1961 studies. The next topic to be discussed is that on alkalinity.

Alkalinity determinations were made on all samples collected during the September and November studies.

The results obtained on individual samples are presented in Appendix A. Average results for each of the stream stations are presented in Table 4. Alkalinity averages for each of the **beet sugar** plant wastes are included in Table 5.

Average concentrations of alkalinity were lower during November than during September. However, the load carried during November by the river was greater than that of September.

During September the load in the river increased from 546,000 to 1,480,000 pounds per day between Torrington and Broadwater. The increase amounted to 931,000 pounds of alkalinity per day. This increase during November was from 309,000 to 1,630,000 or 1,320,000 pounds per day.

The total alkalinity discharged in the combined wastes of the five beet sugar plants amounted to 82,200 pounds per day or approximately 6 percent of the increase in the reach from Torrington to Broadwater.

Hardness determinations were made on all samples collected during the September and November studies. Results of individual sample analysis are included in Appendix A. Average values of the hardness, calcium, and magnesium concentrations are presented in Table 4. All concentration values are recorded as calcium carbonate. Hardness data, including calcium and magnesium, discharged by each of the sugar beet plants is presented in Table 5.

Hardness concentrations during November in general exceeded those of September. During September the load increased from 860,000 pounds per day at Torrington to 1,690,000 pounds per day at Broadwater. The increase amounted to 830,000 pounds of hardness per day. During November the increase was from 515,000 pounds per day at Torrington to 2,140,000 pounds per day at Broadwater, or 1,630,000 pounds per day.

The total contribution of the five sugar plants amounted to 128,200 pounds of hardness per day or 7.9 percent of the additional load picked up in the reach studied.

Specific conductance of natural waters is directly related to the dissolved solids content. The specific conductance, in microhms, times 0.63 will give an approximate value of the dissolved solids content in milligrams per liter.

Average results of specific conductance obtained during September and November are recorded in Table 4 for each of the stream stations. Average results for plant wastes are recorded in Table 5.

Specific conductance did not change appreciably between September and November. The results were slightly higher during September.

Data on chloride, sodium, and sulfate concentrations were collected during the September and November studies. Table 4 includes the average results obtained for each of the study periods.

The chloride content was low during both studies. The sources of the chlorides present are the irrigation return waters and the raw domestic sewage being discharged to the river.

Sodium concentrations decreased between September and November. The November averages were about two thirds of the September averages.

Sulfate concentrations decreased slightly between September and November.

Turbidity and true color determinations were made on each sample collected during the September and November studies. The results of individual samples are presented in Appendix A. Average results for stream stations are included in Table 4 and for plant waste ditch samples in Table 5.

Average values of turbidity and true color units of the stream stations during November did not exceed the values obtained for September. The similar values obtained in the laboratory do not indicate the observed conditions existing in the stream during the two study periods. During November the river had a dark, murky appearance, particularly below the beet sugar plants, whereas during September the river appeared to be quite clear.

Visual observations of the river stations were made during the September and November studies. Sections of the river were observed during November to ascertain the mixing of wastes with the river flow.

During September the river was quite clear in general. Considerable quantities of silt and sand were observed moving with the water along the bottom of the stream bed. During this period silt and sand were the visible load being carried by the river.

During November the river was very clear at the Torrington station. Below the Holly plant discharge the river was divided with the clear flow of the upstream water on one side and a dark murky flow on the other. From below the Torrington Area the turbid murky appearance persisted throughout the reach to Broadwater.

The most severe conditions appeared below the Scottsbluff-Gering-Terrytown Area. Beet toppings and parts were observed floating and attached to fixed objects.

The aesthetic appeal was detrimentally affected in the entire reach of the North Platte from Torrington to Broadwater by the sewage and industrial wastes.

Studies of the chemical, physical and bacteriological qualities of the North Platte River from Torrington, Wyoming, to Broadwater, Nebraska, were made during September and November 1961.

During the September study, raw sewage was being discharged directly to the river by ten communities and by two communities to tributaries. The bacterial population equivalents of the twelve communities totaled 21,720. In addition, nine industries discharged significant quantities of untreated wastes to the river during September. The twelve communities and nine industries are all located in Nebraska, with a major concentration in the Scottsbluff-Terrytown-Gering Area. One community, Torrington, Wyoming, had adequate treatment of its sewage during the survey.

The most serious effects of the wastes on the stream during September were the high bacterial densities downstream from the Wyoming-Nebraska State line. Below the confluence of Horse Creek and the North Platte (River Mile 194), the coliform densities increased in general to a maximum density of 299,000 per 100 milliliter below the Scottsbluff-Terrytown-Gering Area. This is approximately 60 times the 5,000 coliform per 100 milliliter considered to be the acceptable limit of satisfactory water quality. The need for adequate treatment of the untreated wastes being discharged to the river during the September study is indicated by the increased bacterial contamination below the points of discharge.

An average of less than 5.0 milligrams per liter of 5-day 20-degree Centigrade BOD is accepted by a number of pollution control agencies for reasonably clean streams. Though the average values of September did not exceed the 5.0 milligrams per liter at any of the river sampling stations, the 4.9 milligrams per liter value below the Scottsbluff-Terrytown-Gering Area was close, and one sample at the Minatare Bridge had a value of greater than 7.5 milligrams per liter.

The suspended solids load being carried by the river increased throughout the reach studied during September. The major part of the suspended solids was added by irrigation return water. There was a sharp increase in solids below the Scottsbluff-Terrytown-Gering Area.

Though the conditions existing during September do not constitute pollution of interstate water, the necessity of treatment for the wastes being discharged is evident.

The combined wastes of municipal and industrial sources discharged to the river during November contributed a 5-day 20-degree Centigrade Biochemical Oxygen Demand load equivalent to that from a population of 1,570,000. Of these population equivalents, the five beet sugar plants accounted for 1,503,000, the raw sewage discharges 21,700, and other industries 44,700.

The Holly Sugar Company Plant discharged a 5-day 20-degree Centigrade BOD load to the river of 103,000 pounds per day. At the state line, 48.4 milligrams per liter of BOD was present in the river. Below the Scottsbluff-Terrytown-

Gering Area the concentration was 33.9 milligrams per liter. At no point below Torrington did the river have less than 11.1 milligrams per liter in the reach studied. Concentrations were from two to ten times the 5 milligrams per liter considered indicative of a moderately polluted stream.

As a result of the organic load present from upstream and the loads added to the river from the Scottsbluff-Gering-Terrytown Area, the dissolved oxygen content of the river was reduced to 4.5 milligrams per liter and 4.3 milligrams per liter at the Minatare and McGrew stations, respectively. Concentrations of less than 2.5 milligrams per liter were found in two individual samples at the McGrew station. A minimum of 5 milligrams per liter of dissolved oxygen is considered necessary to maintain satisfactory stream quality.

Though the low D.O. concentrations occurred below the Scottsbluff-Gering-Terrytown Area, the residual BOD from upstream sources contributed to the low oxygen levels. Of the computed load of 175,000 pounds per day of BOD in the river immediately below the Scottsbluff-Gering-Terrytown Area, 51,500 pounds per day or 34 percent was residual BOD from upstream sources. Of the 51,500 pounds per day, the Holly Sugar Company plant accounted for about 30,500 pounds per day.

Extremely high concentrations of coliform bacteria were found at all river stations below Torrington during the November study. At the State line the average MPN was 88,600 coliform organisms per 100 milliliter. Below the State line the concentrations increased to a maximum of 1,120,000 per 100 milliliter below the Scottsbluff-Gering-Terrytown Area. Average concentrations below Torrington were 18 to 200 times the 5,000 coliform per 100 milliliter which is usually considered indicative of reasonably satisfactory water quality.

Fecal coliform concentrations during November did not increase appreciably over the September concentrations. However there was a significant increase in the number of fecal coliform present in the river. The greater numbers with similar MPN values were due to the increased flows of November. At the State line there was an average of 15 Bacterial Quantity Units during November. This was an increase of 100 times the average units at Torrington. The total number of fecal coliform present during November at the various river stations was 1.05 to 8 times greater than the total number at the same stations during September.

At the State line the concentration was 1,480,000 streptococci per 100 milliliter. This concentration was 10,000 times the value of 146 streptococci per 100 milliliter at the State line station during September. The highest concentration of 1,630,000 streptococci per 100 milliliter occurred at the Minatare Bridge.

The wastes discharged to the river by the beet sugar plants contributed to the high bacterial load in the river during November. The increase in the bacterial load of November over September was extremely high for the total coliform and fecal streptococci. The increased number of fecal coliform present was sufficient to indicate a significant contribution by the plant wastes.

During November the suspended solids load in the river increased by 2,300,000 pounds per day from Torrington to Bridgeport. The five beet sugar plants discharged 980,000 pounds per day or 43 percent of the increase. The Holly Sugar Company plant at Torrington discharged 108,000 pounds per day to the river. Concentrations of suspended solids discharged in the wastes from the Holly Sugar Company during the November 1961 study indicate that a considerable reduction has been accomplished, though the 54 tons per day were still being discharged. The load of suspended solids in the river increased from 15,200 pounds per day at Torrington to 115,000 pounds per day at the State line.

Pollution of the North Platte River was caused by municipal and industrial wastes during November by (1) causing excessively high concentrations of oxygen-demanding organic matter; (2) depleting the dissolved oxygen content of the river below the minimum acceptable limit; (3) causing excessively high concentrations of bacterial indicator organisms, including those of fecal, or intestinal, origin; (4) by contributing to the excessive suspended solids load; and (5) by destroying the aesthetic value of the river from Torrington to Broadwater.

Irrigation return and natural surface water contributed significant quantities of hardness, alkalinity, sulfates, and suspended solids to the river during the two study periods.

Pollution of the North Platte River at the Wyoming-Nebraska State line by the Holly Sugar Company plant at Torrington, Wyoming, is evident. The pollution originating in the State of Wyoming seriously damaged the water quality at the State line, and the residuals of this pollution, along with the added wastes in Nebraska, contributed to the degraded quality of the 82-mile reach of the river studied.

The condition of the North Platte River had not improved between the study of December 1960 and the studies of September and November 1961. In addition, little if any improvement had occurred since studies conducted in 1950, except the reduction of solids being discharged by the Holly Sugar Company plant at Torrington and a slight reduction of the organic load present in the river below the Scottsbluff-Gering Area.

Pollution by the Holly Sugar Company plant at Torrington, Wyoming, constitutes interstate pollution subject to abatement under the Federal Water Pollution Control Act, since the health and welfare of persons in a State other than that in which the pollution originates is endangered.

That concludes my report.

CHAIRMAN STEIN: Thank you, Mr. Sidio. Are there any questions or comments?

MR. SAMSON: Mr. Sidio, I just want to say to you, and I feel everyone here will agree with me, that this report that you have just submitted represents a tremendous amount of very detailed work, and I think it is a great report. Whether subject to criticism or otherwise is something else again, but personally I say to you that it represents a tremendous lot of great detail and I think it is a tremendous report.

I have a question or two that I would like to ask. Referring now to page 52 on alkalinity, and you mentioned it in your conclusion here, how you associate this question of alkalinity, and you refer to irrigation return and natural surface water, that is on page 57.

MR. SIDIO: Yes, sir.

MR. SAMSON: What is the significance of alkalinity in the North Platte as you have just testified to as you would associate it with the immediate problem that we are concerned with, and that is the beet sugar problem at Torrington? Is there any direct association?

MR. SIDIO: Between the beet sugar plants and the alkalinity load in the river?

MR. SAMSON: Yes.

MR. SIDIO: There is an association, but the contribution by the beet sugar plants is a very minor part of the additional alkalinity added to the river in the region studied. Their load as stated on page 52 amounts to approximately 6 percent. The actual concentration of alkalinity in the river is not considered as a major pollutant.

MR. SAMSON: Well, now, you said that during September the load in the river increased from 546,000 to 1,480,000 pounds per day between Torrington and Broadwater, and then you made this reference on page 57 to irrigation and natural surface water. Do you know of your own personal knowledge whether or not there was a lot of return irrigation water or if there was a great amount of surface water returned to the river in that area?

MR. SIDIO: There are a number of drains returning irrigation return water to the river in the stretch studied, yes.

MR. SAMSON: Thank you very much. The other matter that I wanted to discuss for a moment is on page 43, the fecal coliform bacteria. How do you explain the part where you referred to below the Mitchell sewage and the Great Western Sugar Plant?

CHAIRMAN STEIN: Mr. Samson, we plan to have Mr. Clark--

MR. SAMSON: Very well.

CHAIRMAN STEIN: --who is considered, at least I consider him, the country's outstanding expert on this matter. I wonder if you would hold that question?

MR. SAMSON: That is all right. I will withdraw the question in that respect.

Thank you very much.

CHAIRMAN STEIN: Are there any other questions?

Thank you, Mr. Sidio.

Mr. Clare.

MR. CLARE: I would like to ask Mr. Harold F. Clark to present a discussion on the bacterial studies made. Mr. Clark is Bacteriologist for the Public Health Service working out of the Sanitary Engineering Center at Cincinnati.

Mr. Clark.

MR. CLARK: I would like in my brief statement to refer to Charts 12 and 14, if I may recall them.

In reference to the bacteriology that has been done on these studies, I will not at this time go into the validity of the fecal streptococci tests or the justification of fecal streptococci tests nor that of fecal coliform tests, since it has already been established in a number of past hearings. However, if you have any questions, I will be glad to take up the time in my discussion to answer them.

Both the fecal coliform and the fecal streptococci, as our evidence indicates, are a measure of the fecal pollution in the stream or wherever they may be found. We have found, referring to Chart No. 12, that the fecal coliform at this point here (Torrington) are quite low, both in the earlier and later studies. As we go down here, this indicates that during the November study there was an increase in the fecal pollution in the stream due to the actual fecal content being increased in this stream. And as we go on down, we see fecal coliform increases and the water quality deteriorates due to the combination of sewage, the fecal excreta from warm-blooded animals, and the waste material.

The coliforms may come from a variety of sources, but these coliforms that we are finding that are listed as fecal coliforms, so far as we know, only come from the feces of warm-blooded animals. So, therefore, we are relating that to actual fecal pollution in the sewage. Those organisms are seldom found in soil unless the soil has been recently fertilized with fresh fertilizer or been flooded with highly polluted water.

So we go on down, we find this increase indicating a marked increase on down. And this represents a deterioration of the river due to the various wastes from a variety of sources that are coming in, but in every event related to fecal concentration.

Now, the next chart, 14 I believe is the number, indicates the fecal streptococci. Now, here again we are dealing with an organism, an indicator organism, that doesn't necessarily bear an exact relation to the coliform organism except that they are both inhabitants of the same original source. That again is the feces of warm-blooded animals.

We find here that this organism is very low at the reference sample above Torrington, so that indicates to me that the fecal pollution and sewage pollution that originates in all this reach of the river, 82 miles or whatever it was that the river reaches, is due to pollution that is entering from this point up here (Torrington) and being reinforced down river.

Here you have your streptococci--

MR. SAMSON: Doctor, would you say that again? I didn't quite get what you meant when you just made that statement.

MR. CLARK: The background of streptococci above Torrington is very low, so obviously the deterioration of water quality measured by these fecal indicators of pollution must enter the river between this point here (Torrington) and along this river to cause a deterioration in the quality of the water as measured by these indicator organisms.

I stated that the coliforms and the fecal streptococci did not have a direct relationship except that they were each found in the feces of warm-blooded animals. I would like to kind of qualify that statement at this time.

We can draw a few interpretations from this. If you take the normal human fecal wastes, domestic wastes, in which we have no other pollution coming into it, we find that the fecal coliforms always exceed in density the fecal streptococci present. On the other hand, if we take a mixture of industrial packing house wastes from other warm-blooded animals as well as domestic wastes, then in general the coliform streptococci ratio will be one or less, while in the normal domestic waste it runs between 2 and 4.3 ratio.

In Chart 14 you will notice that these are listed in exactly the same units. Here the streptococci bars are considerably higher than the fecal coliform bars. So that means that we are having a combination of domestic wastes, we are having animal wastes, various industrial wastes coming in here, that that combination is probably due not strictly to domestic wastes but to some animal wastes as well as domestic wastes, that it is increased during November over the earlier period of studies. Now, there may be several causes for that. The survival of these indicator organisms is directly proportional to the organic load in the river. Therefore, any process that increases the organic load in the river--and, incidentally, that will be reflected by an increase in the BOD--would cause an increased survival of these organisms as they go down river.

So in November, if you are getting an increase in organic load in this river, you are probably increasing the survival of these indicator organisms, and we have adequate evidence that where the survival rate of the indicator organisms may be increased, that in the same proportion any pathogenic organisms present may be increased.

The temperature for the fecal coliforms in the river was around ten degrees to twelve degrees. Now, that is too low to show much growth of the indicator organisms in the stream. So, therefore, we can assume that these green bars represent the true fecal coliform load in that stream and is not due to overgrowth going downstream due to the organic load. On the streptococci, you have much of the same evidence.

So in summary, it would seem to me from this data indicated that we have a much higher level of indicator organisms in the November study than we do in the earlier study. The much higher rate of organic matter in the November study probably contributes to the survival of both groups of organisms. The presence of both these groups of organisms, regardless of where they come from, indicates that their original environment was from fecal sewage or the fecal contents of sewage, not the sewage itself.

We must recognize in any instance where we have these organisms present that while at any given time there may be no disease organisms of the enteric group present, sooner or later those organisms are going to be present, and we have no way of knowing whether that is going to be sooner or whether that appearance is going to be later. So we are forced to recognize that as these indicator organisms increase in density, you have an increased probability of the presence of pathogenic organisms, not to mention the possibility of viruses, which I don't want to mention this morning, and, therefore, an increased probability of a hazard to health and welfare of that person or persons coming in direct contact with these waters.

CHAIRMAN STEIN: Are there any comments or questions?

Mr. Williamson.

MR. WILLIAMSON: I would just like to get a little additional information. Trying again to sort out there at the State line where we are interested in, what is the possible source of these bacteria? In other words, just comparing the figures there, during November we know there is a sewage discharge of approximately 200 people from the plant that goes through a septic tank. Now, this is the only human sewage that goes in that stretch of the river. So in our stretch we are getting an indicator of 1,600,000 or 1,400,000. Still you go down here below Gering-Scottsbluff where you have got 10,000, 12,000 people, and your indicator isn't much greater, although your content is only about twice. I mean, populationwise it doesn't tie in. Can 200 people give that concentration of streptococci in that flow of the river? That is the one thing that worries me.

MR. CLARK: To clarify your question, you mean in this part here, or from here to here?

MR. WILLIAMSON: Yes, to the State line, just to the first station below the State line there. There are no packing plants in there, nothing in that stretch at all.

MR. CLARK: And the only thing that comes in there, the only waste that comes in there, is a septic tank waste--

MR. WILLIAMSON: From the plant, Holly plant.

MR. CLARK: And no waste from the sugar--

MR. WILLIAMSON: Well, the sugar wastes plus their septic tank wastes. But, I mean, there is no municipal sewage or other industries.

MR. CLARK: This could be contributed. We figure that from the average human--and this is taking an average, now, not an individual. Individuals will vary all over the map. But I would figure from the average human that the contribution of streptococci is 4,000,000 per gram and an average fecal pollution load, according to Beste and Taylor's Physiological Practice of Medicine, is 150 grams per day. So that would mean 150 grams times 4,000,000 times 200 people would be the average contribution that you would expect from that per capita. And that is within the realm of possibility here.

Also in a septic tank these streptococci are pretty tough organisms. You might be having a warm septic tank there and you might be getting a slight bit of overgrowth which would throw that askew, but it still ties back to indicate originally that it comes from fecal pollution and as such, why, is a hazard.

MR. WILLIAMSON: The only alternative, I was thinking here, would be maybe the silo underdrainage system. Maybe an incubator system, which is one seeded with wastes from the feed lot, or something like this within the silo underdrainage may be causing a growth of this, because it is fairly warm.

MR. CLARK: You are not getting the same amount of growth with your fecal coliforms that you are with your fecal streptococci. Another consideration I would like to bring up for your--

CHAIRMAN STEIN: Mr. Clark, before you get off that, and I am very interested in that because this is what crossed my mind, Mr. Williamson's question, what do you think of the possibility, since this seems to be related to the plant operations, of that silo drainage being an incubation area and permitting heavy growths if fecal contamination from warm-blooded animals gets into that silo drainage system?

MR. CLARK: I am having to just answer purely on hypothetical grounds, because I don't have the temperature of that silo and I don't have a diagram of that silo. I would say that there is a possibility for it to grow. I would say also what I started to say in the first place, you have a high degree of calcium content in this water. Now, your die-off rate of the coliforms would be much greater in a high calcium level with pH above 8 or 7.6 than your--and your strep. They are resistant to a growth of 9.6. In fact, that is one of the tests. Growth of 9.6 is one of the tests we use for their identification as well as growth in 6 and one half percent sodium chloride.

So I would say probably this may represent more nearly the true active pollution. And while pollution exists there, it is probably low due to the cold shock of the organisms killing off some of the organisms, and the survival of the fecal coliforms not being as resistant to this electrolyte and environmental content in the river as your streptococci is another reason to account for this difference. And that this (indicating) represents more nearly your actual fecal pollution load, while this (indicating Chart 12) still confirms this but represents a considerable die-off that we can't avoid.

CHAIRMAN STEIN: How would you relate your pathogen die-off to the strep load and the coliform load?

MR. CLARK: The relationship would be the same. Wherever either one of these increases your fecal pollution load increased, and as your fecal load increases you have a greater chance of pathogens being present and you have to assume that your hazard increases, or potential hazard.

Does that answer your question, Mr. Williamson? I went a roundabout way, but it was the best I knew.

CHAIRMAN STEIN: I have a few more questions, if I may. What kind of a fecal strep or pathogen loading or coliform loading do you get from the inside of a beet?

MR. CLARK: Are you restricting that to beets in general or beets in Wyoming?

CHAIRMAN STEIN: No, to sugar beets, Wyoming, indigenous to this area.

MR. CLARK: In the study of some beets that came from Idaho, I can give you this data. The interior of the beets were sterile as far as the bacterial content was concerned of the pulp. That was in beets with unbroken skins and that would be expected. The outside skins of the beets washed with sterile water and then tested for bacterial loads were practically negligible. The soil around what beets I have studied, and I emphasize the fact that these came from Idaho fields and not from Wyoming so you can't extrapolate too well what applies to here, the soils from those--I will have to refer to my records, please--the soils from those ran in an average of around seventeen or eighteen hundred streptococci per gram, and in the beets that were taken and sent to me and listed as taken from the bin that they were contained in ran about six grams of soil attached per beet.

CHAIRMAN STEIN: The presence of streptococci here, fecal streptococci or fecal coliform, could they be accounted for by soil runoff, do you think?

MR. CLARK: In unpolluted soils?

CHAIRMAN STEIN: In the soils around here.

MR. CLARK: In the soils around here, I can't answer the question. I wouldn't think that it would vary an appreciable number, because it would depend on what types of fertilization was used.

CHAIRMAN STEIN: Ordinarily you would say that you didn't think that this was accounted for by runoff from the soil?

MR. CLARK: No. I think these organisms that we are dealing with here (Chart 12) and the organisms we are dealing with here (Chart 14) came from fecal pollution.

CHAIRMAN STEIN: Right.

MR. CLARK: Now, whether the fecal pollution was added to the soil or not and then it was transferred from the soil to the river or whether it went as fecal pollution directly from the source to the river, I am not prepared to answer.

CHAIRMAN STEIN: Yes.

MR. CLARK: I will state categorically, though, that in my opinion these organisms up here (Chart 14) and these organisms up here (Chart 12) originally came from feces.

CHAIRMAN STEIN: Feces. Let's assume, Mr. Clark, that you had some beets of the same general character that you found in Idaho, and you ran those beets through a flume and you washed them. Could the flume water cause this kind of thing? Alone.

MR. CLARK: It could add to it, but in my opinion it couldn't be responsible for the total.

CHAIRMAN STEIN: Right. All right.

MR. CLARK: And furthermore, you didn't ask this question, but I would like to add it.

CHAIRMAN STEIN: Go right ahead.

MR. CLARK: You asked me about streptococci on beets.

CHAIRMAN STEIN: Yes.

MR. CLARK: I am sorry you didn't ask about fecal coliforms.

CHAIRMAN STEIN: I did.

MR. CLARK: Because in all instances where we tested the beets, we have never found a fecal coliform in any of the beets we have tested.

CHAIRMAN STEIN: Let me ask you one other question, and this goes back to the report generally. Do you have any opinion, dealing with fecal streptococci and fecal coliform, on the significance of dealing with those in the stream as a whole per hundred liter or milliliter?

MR. CLARK: Obviously the density per hundred milliliters here (Chart 12) and the density per hundred milliliters here (Chart 14) in both studies is practically a meaningless figure. You are not interested in how much each hundred cc's contains in your river. You are interested in how many the river contains as a whole. So the old method that has been used in the past five to fifteen or twenty years as recording in coliforms per hundred or streptococci per hundred, in my opinion, is completely obsolete. We should relate this to bacterial quantity units, which Mr. Sidio has quite adequately done, or coliform per thousand cubic feet.

CHAIRMAN STEIN: Just to clarify this, would you consider this increase was a significant amount in the stream as a whole?

MR. CLARK: I would consider this stream fairly well polluted.

CHAIRMAN STEIN: With a consequent increase in pathogenic organisms because of these indicators? And I am not going to get you, I hope, on viruses today.

MR. CLARK: The possibility of pathogenic organisms increases with the density of pollution indicator organisms.

If that were not so, there would be no reason to run them

CHAIRMAN STEIN: Thank you.

MR. SAMSON: I have a question, Doctor. Is it your opinion, based upon your investigation here, that these indicator organisms that you have just talked about as set out in Charts 14 and 12 do not arise out of or are contributed by the discharge of this industrial waste at Torrington, but that the industrial waste discharged into the stream at Torrington creates a very favorable habitat for the survival of these indicator organisms? That is kind of a double-barreled question, but I thought maybe you could cover the whole thing in one answer.

MR. CLARK: If I don't answer it at all, why, call me on it.

This background count here (Chart 12) and this background count (Chart 14) shows a stream of fairly high quality bacteriologically.

MR. SAMSON: Are you referring to the stream at Torrington?

MR. CLARK: Above Torrington.

MR. SAMSON: Above Torrington.

MR. CLARK: This represents a background count before any of the industrial wastes at Torrington enter into it.

Is that right, Mr. Sidio?

MR. SIDIO: That is right.

MR. CLARK: Then the contribution as it goes down in the first place does two things. It adds to the bacterial pollution as measured by these (indicating). If it didn't add to the bacterial pollution, why, we wouldn't have these. It would be the same here.

And secondly, it contributes to the survival rate of these organisms by an increased organic load. As we have frequently shown, as you increase organic load the survival rates are protected against the predators and the other deteriorating influences that you expect in stream purification.

MR. SAMSON: That answers my question, that the contribution of organic waste into the Platte River at Torrington creates a favorable habitat for the survival of those indicator organisms that come into the stream apparently somewhere within the State of Nebraska, is that right?

MR. CLARK: Let me word it another way. If you had no organic load contribution in here, these figures, in my opinion, would be lower.

MR. SAMSON: Well, that answers my question.

MR. CLARK: And the recovery would be more rapid.

MR. SAMSON: Thank you.

MR. CHRISTENSEN: Mr. Clark, I would like to add slightly to the confusion.

It seemed to me that now that we have established that the streptococci is not present in the beets, yet in this report it says, on page 44, paragraph 8, "The Holly Sugar Company Plant at Torrington contributed 18,700 BQU of streptococci with 133,000,000 per hundred milliliters." Is it possible that the operator held a finger on the comptometer too long there? Now, it is charged to the Holly plant, and we do want to correct that condition.

MR. CLARK: My original statement should be, if it wasn't, that the inside pulps of the beets was sterile. Now, that doesn't say that the Holly Sugar Company or any other sugar company--I am not making an allegation against this one sugar company.

MR. CHRISTENSEN: No.

MR. CLARK: That doesn't say that the sugar company isn't contributing considerable pollution in this organism (Chart 14) and these organisms (Chart 12) by the adhering pollution that they bring on the surface of the beets into their plant, wash off of the plants, off the beets, and flows back into the river. It could be the soil and the material in the processing that is contributing a large amount of it.

MR. CHRISTENSEN: Well, what I was after, it just seems like a phenomenal amount comparing to the contribution by the plants down in Nebraska. Why should it be so high? We are trying to correct the situation. We don't question the report, but the contribution is charged to Holly Sugar Company of 133,000,00 per 100 milliliters, and it seems to me that that is a tremendous figure--

MR. CLARK: It is a considerable figure.

MR. CHRISTENSEN: --to show at 8,000,000 to 20 and at Scottsbluff 20,000,000 to 1,000, unless it would come, as has been stated before, from the silo drain or from the septic tank drain, which should have been traced out.

MR. CLARK: Well, I am at a little bit of a disadvantage on this question, because all I have is data on the river here (Chart 14) and the data on the river here (Chart 12), not the data on the various steps in plant processing during the processing procedure.

CHAIRMAN STEIN: Well, I know we don't want to speculate on any plant, but we have been in these situations before where we have had unknowns. Presumably with the figures you have had, if there is even a break or one pipe coming in carrying a fecal material from warm-blooded animals, that could raise this to this amount if that came into the right place.

MR. CLARK: There is no doubt that the domestic and industrial waste coming in here (Chart 14) is responsible for this density. Now, just how to partition it among the various portions outside of this river, I am not able to do. But I am convinced in my own mind that there is this much pollution at this point (Chart 14) and that there is this much fecal coliforms at this point (Chart 12), and that those figures are not open to doubt.

CHAIRMAN STEIN: Are there any further questions or comments?

If not, thank you, Mr. Clark.

We do have a biological report, or we can adjourn for lunch now. It may be wise to adjourn for lunch and see if we can beat the crowd and come back. I know a lot of people want to get out of here early this afternoon. If we go now, will it be agreeable if we can reconvene promptly--there is that promptly again--at 1:30 and try to push through? And the way this looks, I am sure we can be out before 4:00 o'clock.

So that is agreeable. We stand at recess for lunch.

(NOON RECESS)

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AFTERNOON SESSION, WEDNESDAY, MARCH 21, 1962

CHAIRMAN STEIN: May we reconvene.

Mr. Clare.

MR. CLARE: I should like to call next on Dr. Joe K. Neel. Dr. Neel is our Regional Biologist and Chief of Water Quality Section of our Water Pollution Control program. Dr. Neel was instrumental in a survey of the biological characteristics of the North Platte River.

At this time we would like to have Dr. Neel's report. While he is coming forward, I might ask Mr. Townley for any rearrangement that the board might do here to see this.

MR. TOWNLEY: Yes, Mr. Clare.

Dr. Neel will use some slides during his presentation, so, Mr. Chairman, if I may, I would suggest that the Conferees take a position from which they can see the screen behind them. The table will be all right, but would you please move your chairs.

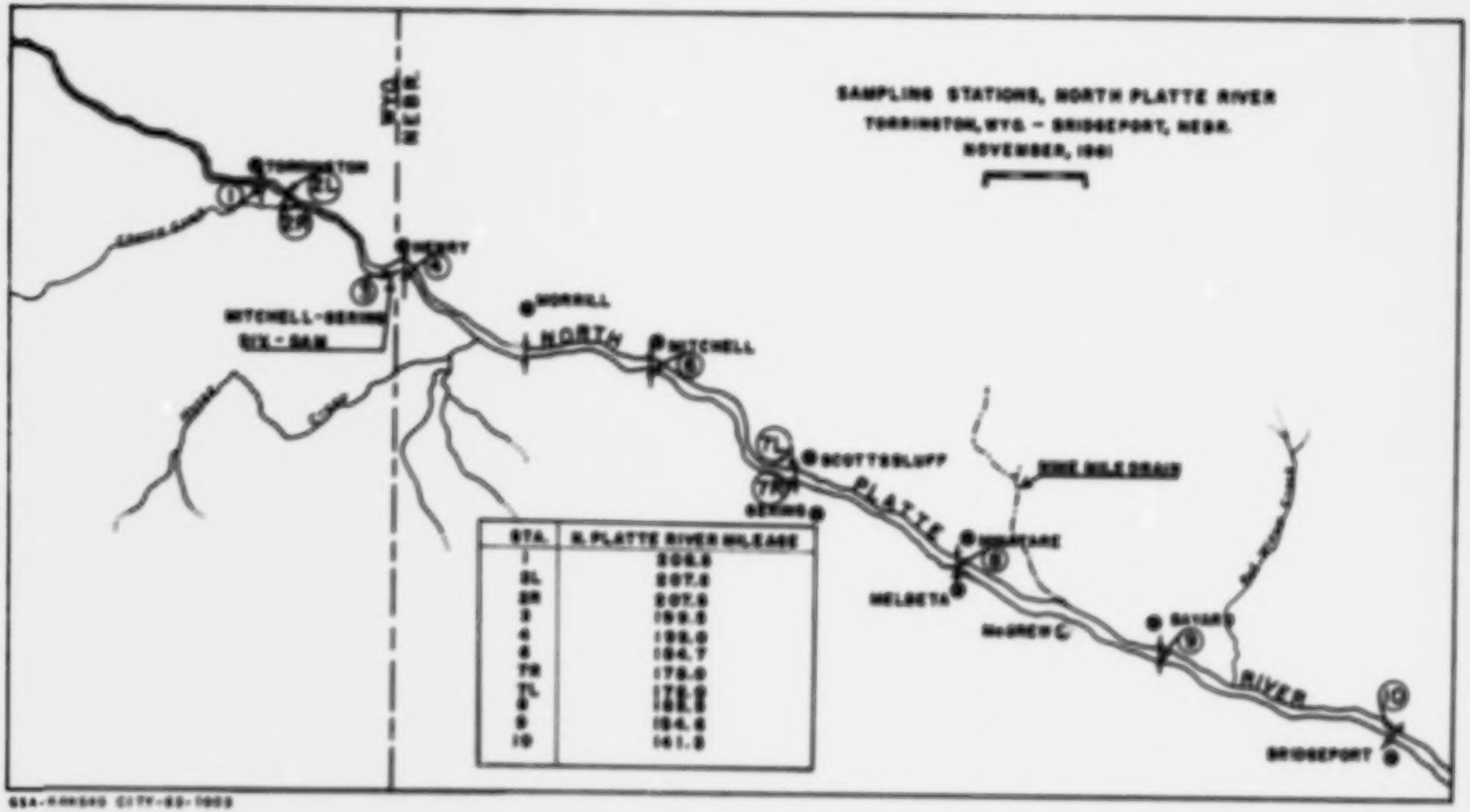
DR. NEEL: Collections and field observations to evaluate the biological effects of wastes discharged to the North Platte River by beet sugar factories in the Torrington, Wyoming to Bayard, Nebraska reach, were made on November 16 and 17, 1960; August 30 - September 1; October 4, 5, 6, 10, 11, 14, 15, 30, 31, and November 1 and 2, 1961. Information acquired in the November 1960 and August - September 1961 investigations was presented to the first session of this Conference in Scottsbluff, Nebraska, September 12, 1961, and will enter into this report only as needed to supplement later observations or enhance interpretations. In 1960, studies covered the reach from above Torrington to Morrill, Nebraska, but all later investigations extended from Torrington, Wyoming to Bridgeport, Nebraska. Station numbers and locations were as follows:

Station	Location	River Mile Above Mouth
1	Torrington, Wyoming Bridge	208.5
2L	Left Side of River, 1 mile Below Station 1	207.5
2R	Right Side of River as Above	207.5
3	Gering-Mitchell Diversion Dam	199.5
4	Henry, Nebraska Bridge	199
6	Mitchell, Nebraska Bridge	184.7
7R	Right Channel West Scottsbluff, Nebraska Bridge	178.0
7L	Left Channel at Above	178.0
8	Minatare-Melbeta Bridge	165.5
9	Bayard, Nebraska Bridge	154.6
10	Bridgeport, Nebraska Bridge	141.5

Before I get started, I would like to acknowledge the assistance we received in making these studies. Mr. William F. Rapp, Jr., Entomologist with the Nebraska Department of Health, assisted us with all field studies and arranged for a sorting of the benthic or bottom organisms in October and November 1961. We were also assisted by Mr. Francl Krebs of the Department of Health. Neither one of those gentlemen is here, but since Mr. Filipi, who is in charge of their division, is here, I wonder if Mr. Filipi would rise and take a bow for the assistance these people rendered us.

MR. FILIPI: Thank you very much for acknowledging those.

DR. NEEL: The Wyoming Game and Fish Commission supplied equipment needed for the collection of fishes and also personnel to handle its equipment and assist with fish collection. Mr. Larry Peterson was in charge of that unit. He was here this morning. Is he here this afternoon? When he comes in later on, we will have him stand.


SAMPLING STATIONS, NORTH PLATTE RIVER
TORRINGTON, WYO. – BRIDGEPORT, NEBR.
NOVEMBER, 1961
WYO.
NEBR.
TORRINGTON
1
2L
2R
HENRY
3
4
MITCHELL-GERING
DIV. - DAM
MORRILL
NORTH
MITCHELL
6
7L
7R
SCOTTSBLUFF
GERING
PLATTE
NINE MILE DRAIN
MINATARE
8
MELBETA
McGREW
BAYARD
9
RIVER
10
BRIDGEPORT

STA.	N. PLATTE RIVER MILEAGE
1	208.8
2L	207.8
2R	207.6
3	199.5
4	198.0
6	184.7
7R	179.0
7L	178.0
8	168.5
9	154.6
10	141.3

GSA-KANSAS CITY-63-1003

Mr. Jack Geckler, the Biologist with the Field Investigation, Technical Services Branch, Sanitary Engineering Center, U. S. Public Health Service, in Cincinnati, made collections of benthos and observations over the period October 4 to 15, 1961, and Mr. Ron Kent of the Wyoming Game and Fish Commission also assisted with the collection of fishes in October and November 1961.

If we may have the lights out now, we will proceed with the slides.

The bottom of this reach of the North Platte River is largely sand. Driftwood accumulations occur at several bridges and diversion dams, and pieces of wood are caught in the sand in many areas. Rocks and gravel are exposed for a few miles below Torrington (an old coffer dam is still in place below the bridge).

In November 1960, fresh accumulations of sugar beet tops, cossettes, pulp and other particles were common down to the vicinity of Morrill, Nebraska. A photograph showing quantities of such materials recovered from one Pettersen dredge haul at Henry, Nebraska, was included in material presented to the Conferees September 12, 1961. In August 1961 the only evidences of such materials were a few silt-covered deposits or "sludge banks" in the area below Torrington, near the Henry bridge, and above the Mitchell bridge. The fate of the great masses of beet particles seen in 1960 is unknown, but it seems reasonable to assume that they were moved on downstream as part of the bed load. Beet parts were much less noticeable in October and November 1961. Tops were seen floating downstream from time to time, and suspended pulp was evident for some distance below Torrington, but no deposits (other than scattered bits of pulp, etc., along the right bank below Torrington) were noted anywhere. Silt settled from beet waste onto the rocky bottom below Torrington each year. It was not as easily recognized on sand bottoms farther downstream.

The North Platte stream bed contains numerous small islands or "towheads" that separate flow into two or more channels at most localities. The presence of these anastomosing and branching streams may permit isolation of tributary or waste discharges for varying distances. Areas investigated in these studies often exhibited distinct differences in water quality in individual channels, but water appearance tended to become more uniform with increasing distance below each sugar beet processing area. Some mention of channeling and water quality differences will appear in the following account.

Volume of flow at selected stations during times of these studies is shown in Table 1. Discharge in the fall of 1961 generally exceeded that of November 1960, and greater quantities of water played some role in turbidity reductions noted in the upper reach below Torrington. August and September flows represent the residual from irrigation withdrawals plus quantities added from return flows (drains).

On all visits, water was clear at Station 1. In November 1960 discharges from the Torrington beet factory discolored about one half of the river down to the region of Station 3. Flow through the control channel just below the Gering-Mitchell Ditch gate mixed the turbid beet wastes into all discharge, and the entire river was dingy brown or gray in appearance from there down to Morrill. In late August and early September 1961 the river remained clear down to the mouth of Kotzer Drain, about one quarter mile above Gering-Mitchell Ditch. Muddy water from the drain colored a narrow strip of water along the right bank (most of it entered the ditch) and the river was slightly dingy at Station 4. A low turbidity was then maintained down to the vicinity of Scottsbluff. A sharp increase noted at the Minatare-Melbeta bridge gradually faded out, and the stream was but slightly discolored at Bayard and Bridgeport. In October and November 1961 conditions of the preceding autumn were largely duplicated. Discharge was somewhat higher, and some suspended matter was carried over to the left bank within the first mile below the Torrington beet waste outfall. However, distinct differences in turbidity, left and right, were usually maintained down to Station 3, where complete mixing again occurred. Some fluctuations were noted, but turbidity was maintained at high levels (but lower than in 1960) all the way to Bridgeport and below. Important contributions came from sugar plants at Mitchell, in the Scottsbluff area, and at Bayard, but suspended matter also entered from irrigation drains. In August 1961 a small segment of flow was briefly discolored by entrance of sanitary sewage from the Torrington beet plant.

In November 1960 benthic algae were abundant on firm bottom materials (stones, wood, etc.) in the area above the Torrington beet discharge and on stones near the left bank for some distance below. No such growths were evident near the right bank in this region or anywhere in the river in areas visited below the Gering-Mitchell Ditch. In late August and early September 1961 algae were attached to all suitable substrates at all collecting stations. Dominance varied from

Table 1.
Discharge, cfs, at Selected Sites, North Platte River

	Sta. 1	Sta. 3	Sta. 6	Sta. 8 Main Channel	Sta. 10 Main Channel
November 16, 1960	260	290			
November 17, 1960	254	284			
August 30, 1961			111		67
August 31, 1961			114		
September 1, 1961			136		
October 4, 1961	370	235			1040
October 5, 1961	375	240			
October 6, 1961	370	235		437	
October 10, 1961	360	392	557		
October 11, 1961	340	368			
October 14, 1961	330	362			
October 15, 1961	330	362			1186
October 30, 1961	320	350			
October 31, 1961	315	344			
November 1, 1961	320	350			
November 2, 1961					

place to place, but *Cladophora*, a green alga, was the major growth in most areas. Other green algae attaining dominance were *Microspora*, *Spirogyra*, *Rhizoclonium*, *Oedogonium*, and *Hydrodictyon*. A red alga, *Compsopogon*, formed almost the entire algal crop near the Henry bridge, and a diatom, *Diatoma vulgare*, made up part of the dominant growth at the Mitchell bridge.

In late October and early November 1961 attached algae were found at Stations 1, 2L, 4, 6, 7, and 9. *Cladophora* and *Diatoma vulgare* were dominant at most sites visited. *Compsopogon* was the major growth at Mitchell (Station 6) and in some areas near the West Scottsbluff Bridge (Station 7). The filamentous bacterium *Sphaerotilus*, commonly called "sewage fungus," was very much in evidence at this time. It shared the bottom with algae at Stations 2L, 4, 6, 7, and 9, and was the only growth present at Stations 2R, 3, and 8. Detached masses, patches, and strands floated downstream in great profusion at Stations 3, 4, and 8, and were by no means rare at other collecting sites. No *Sphaerotilus* was observed in November 1960 and in August and early September 1961 it was seen only in the very small area crossed by undiluted sanitary sewage from the Torrington beet factory. It must be assumed that widespread growth of *Sphaerotilus* in the fall of 1961 was made possible by carbohydrates contained in beet sugar wastes. Its absence on November 16 and 17, 1960, when the same wastes were in the river, probably represented restrictive influences of greater turbidity. *Sphaerotilus* is adversely affected by turbidity increases and may completely disappear for varying periods of time following entrance of any appreciable surface runoff.

Aquatic flowering plants (*Potamogeton* spp.) were observed at Torrington, Station 2L, the Gering-Mitchell diversion dam, Mitchell, West Scottsbluff, Bayard, and Bridgeport. They were more noticeable in August and September, 1961, than during the previous or following autumn, but conditions developed by sugar beet wastes did not favor their observation.

Attached algae and rooted aquatic plants are utilized directly as food by some fishes and a number of bottom animals, and in this manner serve as the basic link of food chains for other fishes and some other aquatic vertebrates. Conditions restricting their areas of growth can substantially reduce overall biological productivity.

In November, 1960, these benthic organisms were present in considerable numbers and variety in the region immediately above the Torrington beet factory outfall and in the left half of the river for a few miles below. Only midge larvae and sludge worms were found under the beet wastes that occupied the right half of the stream down to the Gering-Mitchell Ditch and the entire stream from there to Morrill. These latter types are notably tolerant of organic pollution. In late summer (August-September) of 1961, the barren areas of the preceding November had been repopulated by a number of organisms. The most abundant animal contributing to this new population was a mayfly, Heptagenia diabasia, whose nymphs occupied driftwood at all sites examined from Torrington to Bridgeport. These nymphs were the only organisms found in the vicinity of the Minatare-Melbeta bridge (Station 8). Other bottom dwellers that returned to previously depopulated areas were flatworms, scuds, stoneflies, four other mayflies, damsel flies, creeping water bugs, and black flies. As would be expected, barren areas nearest survival regions remaining in the fall of 1960 were "reseeded" with the greatest number of forms. The right half of the river below Torrington developed 12 forms in addition to the midge larvae found there in November 1960. The area around the Henry bridge produced only six new forms.

The above observations suggested that depletion of bottom inhabitants in areas coming under the influence of sugar beet wastes is an annual occurrence. Some recovery is apparently possible each year, but opportunity for repopulation by a number of forms declines with distance below unaffected water, which seemingly ends when all flow paths are mixed in passage through the control channel at the Gering-Mitchell Ditch. Insects, such as mayflies, that embark upon long egg-laying flights, are most capable of repopulating more remote reaches.

In the fall of 1961, collections and field observations were planned to ascertain what actions of sugar beet wastes were responsible for the decimation of benthos and how much time was required. The campaign began around October 1 and collections were resumed October 4. Organisms recovered through November 2 are shown in Table 2. Benthic animals were virtually eliminated from the right half of the river one mile below Torrington by October 10, and none could be found on October 14 or later. Organisms disappeared at Henry before October 31 and before November 1 at the Minatare-Melbeta bridge. Bayard was reduced to one form of midge larva before November 1. Persistence of some organisms at Mitchell seemingly indicates some recovery from Torrington beet wastes, and it appeared that conditions at the West Scottsbluff bridge (Station 7) were improved by some retention of flow in a gravel pit just upstream.

Table 2.
NORTH PLATTE RIVER BENTHOS
October and November, 1961

Station 1		Station 2L				Station 2R				Station 3				Station 4				Station 6			
10/4	10/30	10/4	10/10	10/14	10/31	10/4	10/10	10/14	10/31	10/5	10/10	10/14	10/31	10/5	10/10	10/14	10/31	10/5	10/10	10/14	11/1
								N	N								N				
x	x	x	x	x		x		O	O	x	x	x	x	x	x		O				
								O	O								O				
x		x				x		R	R	x							R				
			x					G	G	x							G				
	x							A	A								A				
								N	N								N				
								I	I								I				
x			x	x	x			S	S	x	x			x	x	x	S	x		x	
								M	M								M				
								S	S								S				
					x	x		F	F	x		x	x	x	x	x	F	x	x	x	x
								O	O								O				
								U	U								U				
								N	N								N				
								D	D								D				
x	x									x											
										x											
x		x	x	x		x				x	x	x		x	x	x			x		x
x	x	x	x	x						x	x	x		x	x	x		x	x		
		x													x						
x	x									x		x		x	x	x		x	x	x	x
x	x	x	x	x		x															
		x	x	x						x					x			x	x		
										x				x							
										x											
x																					
x		x	x																		

Table 2.
NORTH PLATTE RIVER BENTHOS
October and November, 1961

	Station 6			Station 7					Station 8			Station 9			Wild Horse Drain	Station 10			Drain 2
		R 11/1		10/6	10/11	10/14	L 11/1	R 11/1	10/6	10/15	11/1	10/6	10/14	11/1	11/2	10/6	10/15	11/2	11/2
Platyhelminthes											N							C	
Dugesia sp.						x					O							O	
Annelida																		L	
Leeches											O							L	
Nephelopsis sp.				x							R				x			E	
Sludge Worms											G							C	
Aquatic Earthworms											A				x			T	
Mollusca											N							I	
Snails											I							O	
Physa sp.				x		x	x		x		S		x					N	x
Lymnaea sp.					x					x	M								x
Crustacea											S							I	
Scuds																		M	
Hyalella azteca		x		x	x	x	x		x	x	F	x	x					P	
Sow Bugs											O							O	
Asellus militaris											U				x			S	
Asellus brevicaudus											N				x			S	
Crayfish											D							I	
Orconectes virilis				x													x	B	
Insecta																		L	
Stoneflies																		E	
Perlesta placida																			
Acroneuria sp.																			
Mayflies																			
Tricorythodes sp.				x								x					x		
Heptagenia diabasia				x	x	x	x		x	x		x	x			x			
Heptagenia flavescens																			
Baetis spp.		x		x	x	x	x	x	x	x		x	x			x	x		
Pseudocloeon sp.																			
Centroptilum sp.															x				x
Isonychia sp.																			
Hexagenia limbata																			
Traverella sp.																			
Choroterpes sp.																			

Table 2.
NORTH PLATTE RIVER BENTHOS
October and November, 1961

Station 1		Station 2L				Station 2R				Station 3				Station 4				Station 6			
10/4	10/30	10/4	10/10	10/14	10/31	10/4	10/10	10/14	10/31	10/5	10/10	10/14	10/31	10/5	10/10	10/14	10/31	10/5	10/10	10/14	11/1
								N	N								N				
								O	O								O				
x	x	x	x	x	x	x				x	x	x		x	x						
x		x		x	x	x		O	O	x		x		x			O		x		
x		x	x	x	x	x		R	R	x				x	x		R				
								G	G								G				
x		x						A	A	x	x			x			A				
								N	N								N				
x		x	x	x		x		I	I	x	x	x		x	x		I				
x			x					S	S			x		x	x	x	S	x	x		
								M	M			x					M				
								S	S					x			S				
								F	F								F				
x	x	x	x	x	x	x	x	O	O	x	x	x	x	x		x	O				x
		x		x	x			U	U								U				
						x		N	N			x		x			N				
								D	D	x				x			D				
		x	x							x		x									
			x											x							
										x		x									
	x																				
x	x	x				x				x	x	x		x	x	x			x	x	x
				x						x											
x	x														x						
	x		x															x		x	x x

Table 2.
NORTH PLATTE RIVER BENTHOS
October and November, 1961

	Station 6			Station 7					Station 8			Station 9			Wild Horse Drain	Station 10			Drain 2
		R 11/1		10/6	10/11	10/14	L 11/1	R 11/1	10/6	10/15	11/1	10/6	10/14	11/1	11/2	10/6	10/15	11/2	11/2
Insects (cont'd)																			
Damsel flies											N							C	
Argia sp.							x				O							O	
Amphiagrion sp.		x										x						L	
Hetaerina sp.											O							L	
Dragon flies											R							E	
Ophiogomphus sp.											G							C	
Bugs											A							T	
Ambrysus sp.											N							I	
Sigara spp.					x			x			I	x	x				x	O	
Ranatra sp.											S							N	
Notonecta undulata											M								
Lethocerus americanus						x					S							I	
Caddis flies																		M	
Hydropsyche aerata											F							P	
Hydropsyche bifida gr.											O							O	
Cheumatopsyche sp.											U							S	
Leptocella diarina											N							S	
Limnephilus consocius											D							I	x
Beetles																		B	
Laccophilus sp.																		L	
Agabinus sp.																		E	x
Tropisternus sp.																			
Gyrinus sp.																			
Elmidae sp.									x										
Flies																			
Blackflies																			
Simulium (Nevesimulium																			
--vittatum)																			
Simuliidae spp.		x		x	x			x				x				x			
Midges																			
Pentaneuria sp.																			
Spaniotoma nivoriunda																			
Spaniotoma spp.		x					x	x	x	x		x	x	x	x		x		

Table 2.
NORTH PLATTE RIVER BENTHOS
October and November, 1961

Station 1		Station 2L				Station 2R				Station 3				Station 4				Station 6			
10/4	10/30	10/4	10/10	10/14	10/31	10/4	10/10	10/14	10/31	10/5	10/10	10/14	10/31	10/5	10/10	10/14	10/31	10/5	10/10	10/14	L 11/1
								N													
								O													
	x																				
								O													
								R													
								G													
			x	x				A			x										x
								N													
								I				x									
								S													
		x				x		M		x	x									x	
								S													
																					x
								F													
								O													
								U													
								N													
								D													

Table 2.
NORTH PLATTE RIVER BENTHOS
October and November, 1961

	Station 6			Station 7					Station 8			Station 9			Wild Horse Drain	Station 10			Drain 2
		R 11/1		10/6	10/11	10/14	L 11/1	R 11/1	10/6	10/15	11/1	10/6	10/14	11/1	11/2	10/6	10/15	11/2	11/2
Insects (cont'd)																			
Midges (cont'd)																			
Cardiocladius obscurus																			
Chironomus (Cricto.)																			
--flavicingula												x							
Chironomus (Limno.)																			
--modestus or tumidus		x		x															
Chironomus (Endo.)																			
--nigricans																			
Chironomus (Chironomus)																			
--militaris																x	x		
Anthomyiidae																			
Limnophora aequifrons															x				
Miscellaneous																			
Nematodes		x																	

Note: N organisms were found in Drain 1 November 2, 1961.

Numbers of organisms and variety of forms were reduced at these two localities. With these two exceptions, it appears that the sugar beet industry eliminates bottom organisms in all river reaches between the Gering-Mitchell diversion dam and Bridgeport; and less than one month is required for realization of this condition.

Study of organisms taken at intervals during the month of October indicated that death of most was due to an indirect effect of sugar beet wastes--stimulation of Sphaerotilus growth. Figures 1, 2, and 3 show the condition of mayfly nymphs (Heptagenia diabasia) from near the Henry bridge at varying periods of time after start of the beet campaign. Figure 1 shows a nymph without Sphaerotilus growth (October 6), Figure 2 indicates the beginning of bacterial attachment, and Figure 3 is a photo of a nymph completely swaddled and restricted by Sphaerotilus filaments (October 14). Death usually follows development of this condition. Dead mayfly nymphs were observed at Stations 3, 6, 8, and 9 on October 14 and 15.

The North Platte was noticeably more turbid in November of 1960 than in October and early November 1961, and, since Sphaerotilus was absent during the 1960 visit, processes involved in elimination of benthos by that beet campaign may not safely be attributed to this bacterium, although there is no assurance that it did not occur earlier in the season. Bottom organisms were covered with fine silt soon after the start of beet processing in October 1961, and it seems reasonable that some mortality resulted from this action in 1960 and 1961. Silt entering from irrigation drains in late summer 1961 did not have this effect.

Study of Table 2 will show that benthos was greatly reduced in some reaches where it still persisted at the end of October 1961. The left bank of the river below Torrington was considerably more affected by waste discharges in 1961 than in 1960. Disappearance of benthos from this reach and in the vicinity of the Gering-Mitchell diversion dam may have occurred before January 1, 1962. Complete loss of benthos at Mitchell and West Scottsbluff appeared less likely.

In November 1960 fishes generally avoided areas coming under influence of sugar beet wastes in the reach immediately below Torrington, but no indication of fish reactions could be gained below Station 3. Collections made by the Wyoming Game and Fish Commission in October 1957 showed definite avoidance of waste-laden water by most piscine species. Fishes

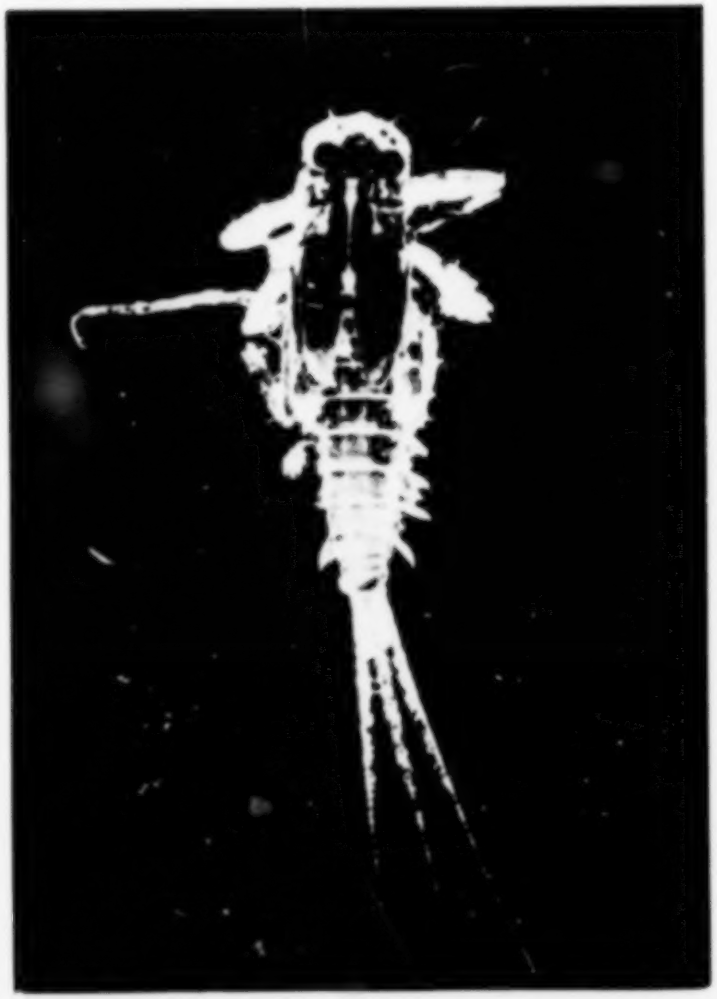


Fig. 2. Mayfly nymph with beginnings of *Sphaerotilus* growth. Sta. 4, October 10, 1961.

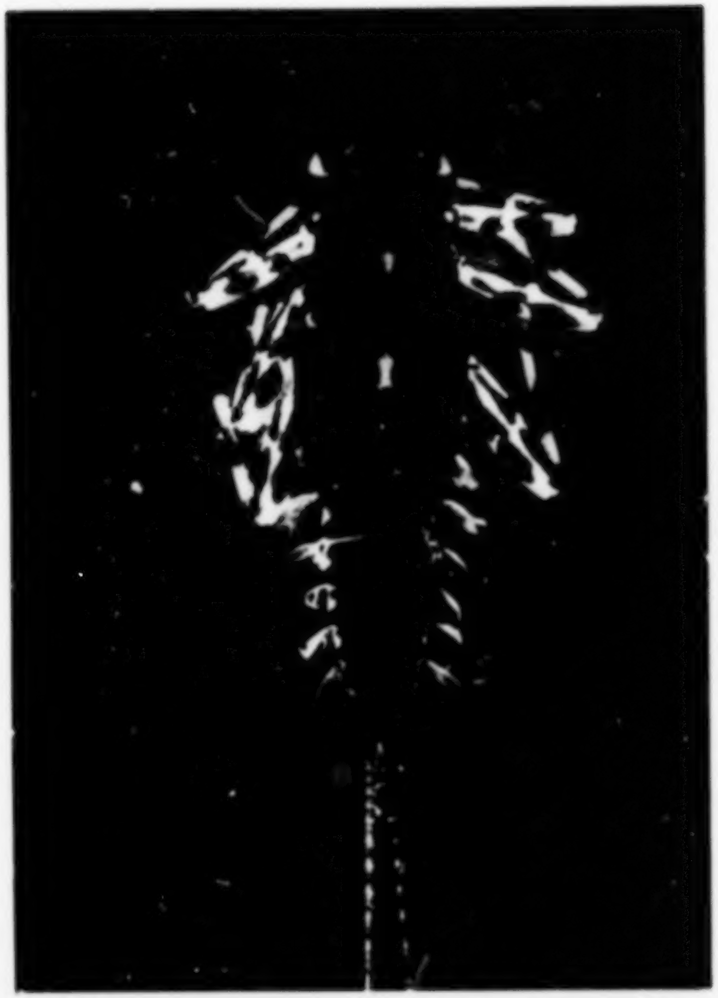


Fig. 1. Mayfly nymph with no *Sphaerotilus* growth. Sta. 4, October 5, 1961.

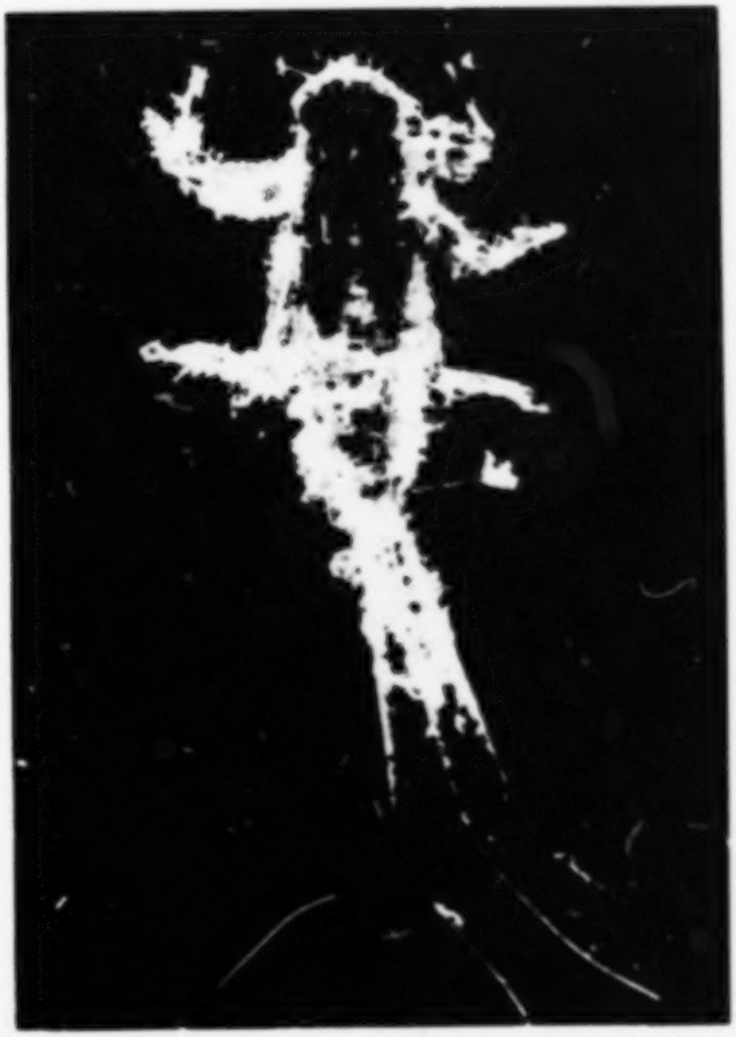


Fig. 3. Mayfly nymph with heavy *Sphaerotilus* growth. Sta. 4
October 14, 1961.

occurred in all river reaches visited in late summer 1961, and it appeared that they, like the benthos, were forced from many areas during seasons of beet factory operation. There were no evidences of fish mortality in 1957 and 1960, and it was assumed that they moved out of the above areas as conditions became intolerable, probably migrating into drains and other tributaries in those regions where wastes spread over the entire river. It was recognized that knowledge of the abode of fishes during fall and winter would add considerably to understanding of pollutional effects, and arrangements were made for a cooperative study by the Wyoming Game and Fish Commission, the Nebraska Game, Forestation, and Parks Commission, the Nebraska Department of Health, and the U. S. Public Health Service. Field collections and observations were made over the period October 30 to November 1, 1961.

Observations by Mr. Jack R. Geckler, U. S. Public Health Service, over the period October 4-14, 1961, indicated that fish again avoided waste-carrying water below Torrington and at Stations 3 and 8. He noted great numbers of fish crowded into a small clear drain at Bridgeport.

Fishes secured at each station with a DC electro-shocking rig over the October 30-November 1 period are indicated in Table 3. Accurate quantitative estimates of fishes are difficult to secure by this or other methods that take live specimens. The same length of shoreline (300 feet) was covered at each locality, and fish are designated as rare, common, or abundant, with respect to their concentration along such distances. Exact numbers and weights of fishes were not recorded, and all specimens, other than small numbers retained for record, identification, and stomach analysis, were returned to the river alive. Collections were made in what appeared to be the best fish habitat at each locality. At the majority of stations, fish were found only in the immediate vicinity of the river banks and in some localities were restricted to small seeps or inflows that formed minor clear water areas at the margins.

Twenty-four species were found in the entire sampled reach. The greatest number of species found at one locality was 16 at Station 1. Fifteen occurred in Drain 1 at Station 10. Neither water area suffered any deleterious pollutional effects at the time of these collections. Number of species declined rather rapidly in the river below Station 1. Station 2L was somewhat affected by beet wastes (water was turbid and suspended pulp fiber common), but Station 2R carried most of the Torrington

Table 3.
Distribution and Relative Abundance of Fishes
In the North Platte River
Torrington, Wyoming to Bridgeport, Nebraska
October 30 - November 1, 1961

	Sta. 1	Sta. 2L	Sta. 2R	Sta. 3	Gering -[1] Mitchell Ditch	Sta. 4	Sta. 6	Sta. 7 R. Channel	Sta. 7[2] L. Channel	Sta. 8	Sta. 9 Edge of N. Chan.
Gizzard shad											
Brown Trout	R						R				
Rainbow Trout		R*									
Carp Sucker	R										
Long Nosed Sucker	A	A	C	A	A	C	R	A	R	R	
Western White Sucker	A	A	C	A	A	C	R	A	R	R	R
Northern Red Horse	C		R	C							
Carp	C	A		A	A	A	R	A	R	R	C
Long nose Dace	C	C	R		C	R	R	C	R		
Northern Creek Chub	A	A	C	A	A	C	R	A	R	R	C
Brassy Minnow	R			R		R	R	A	R		R
Red Shiner	C								R		
Sand Shiner	C	C	R	C		R	R	R	R	R	
Common Shiner	R	R		R	A	R			R		
Fathead Minnow			R								R
Stone Roller	R	R						R	R		
Stonecat		C			C						
Black Bullhead	R										
Banded Killifish				R				C		R	R
Plains Top Minnow											R
Green Sunfish	R										
Black Crappie								R			
Largemouth Black Bass											
Yellow Perch	R							R	R		

*One specimen from center
A=abundant
C=common
R=rare

[1] Isolated from river, gate closed

[2] Main channel

Table 3.
Distribution and Relative Abundance of Fishes
In the North Platte River
Torrington, Wyoming to Bridgeport, Nebraska
October 30 - November 1, 1961

	Sta. 9 Along Center Towhead	Sta. 9 Ditch by Sugar Beet Beet Disposal Area	Sta. 10 Right Bank	Sta. 10 Drain 1	Sta. 10 Drain 2	Sta. 9 Wild Horse Drain Near Bayard	Drain (Nine Mile?) Near McGrew
Gizzard shad			C	C			
Brown Trout			R	C		A	
Rainbow Trout							C[3]
Carp Sucker				R			
Long Nosed Sucker					C	A	A
Western White Sucker	C	C	C	C	C	A	A
Northern Red Horse	R	R					
Carp	C	C	A	A	C	A	A
Long nose Dace				C		C	
Northern Creek Chub	C	C	A	A	C	A	A
Brassy Minnow	R		C	A	C	C	R
Red Shiner				C	C	C	C
Sand Shiner	R	R	R	C	C		R
Common Shiner							
Fathead Minnow				C	C		R
Stone Roller							
Stonecat							
Black Bullhead				R			
Banded Killifish	R		R	C	A		
Plains Top Minnow							
Green Sunfish				R	R	R	
Black Crappie							
Largemouth Black Bass				R			
Yellow Perch							

---

[3] A number of large specimens, > 4 lbs.

factory discharge. Fishes in 2R could easily retire to better conditions left of center (Station 2L). Most fishes at Station 3 (eight species) were aggregated in clear water in a side channel just below the diversion dam--very few occurred in the river below the control channel. Those present in the upper end of the Gering-Mitchell Ditch were trapped between the gate and a dry area about 200 feet downstream. This was not a situation conducive to a very varied fauna. At Station 4, eight species of fish were found along the right bank, where some clear water retreats were available. Station 6 collections came from along the margin of the main flow path; no clean water refuges were near at hand, and fish were widely scattered. The right channel at Station 7 carried a small percentage of total flow, largely from the gravel pit, and its most noticeable evidence of pollution was a comparatively moderate level of turbidity. Its fish population was as concentrated as any found in the river, but very few fishes occurred in the left channel, which carried most of the discharge and by far the greater part of the waste load. Surprisingly, each channel had the same number of species, eleven, but not all the same species. At Station 8, fish were found only in a narrow channel along the right bank, and their numbers were quite low. Fish survived conditions in the north channel at Station 9, which carried a poor quality effluent from the Bayard sugar plant waste treatment area, by crowding into a small patch of clear water entering from a seepage area. They were also rare along a towhead near the stream center. The ditch receiving effluent from the broad field beet waste disposal area had few, if any, escape niches of clean water. Two clear water drains at Station 10 (Drains 1 and 2) held considerable concentrations of fishes, and appeared to be havens from which fishes could move out along the adjacent river shoreline. Concentration in these drains was much greater than that noted anywhere in the river. It might be argued that gizzard shad at Station 10 indicated considerable waste amelioration, as these fishes are usually unable to endure organic wastes, but their existence in that region may have been assured by the proximity of clean water in the two drains.

Two larger clear drains, Wild Horse near Bayard and Nine Mile near McGrew, held active, healthy fish populations containing considerable numbers of trout. Only brown trout were found in Wild Horse Drain, and rainbows alone were taken in Nine Mile. Variety of fishes in these drains was not as great as in those at Station 10, but they were not as suitable for killifishes and sunfishes.

Table 4 simplifies Table 3 by indicating at how

Table 4.
Number of Localities Inhabited by Each Fish Species And Degree of Waste Tolerance Exhibited by Each

Fish Species	No. Localities Where Found	Apparent Tolerance To Beet Wastes
Northern creek chub	18	++++
Western white sucker	18	++++
Carp	17	++++
Sand shiner	14	++++
Long nosed sucker	13	++++
Brassy minnow	11	+++
Long nose dace	10	+++
Banded killifish	7	+++
Red shiner	6	0
Common shiner	6	++
Fathead minnow	5	++
Brown trout	5	+
Stone roller	4	++
Green sunfish	4	++
Northern red horse	4	++
Yellow perch	3	+
Stonecat	2	0
Black bullhead	2	0
Rainbow trout	2	+
Carp sucker	2	0
Gizzard shad	2	0
Black crappie	1	+
Largemouth black bass	1	0
Plains top minnow	1	++

++++ very tolerant
0 intolerant

many of the 18 sampling sites each species of fish occurred and also lists the observed ability of each to endure the beet wastes. It is not surprising to note that the most widespread forms were those with greatest tolerance for this type of pollution. Table 5 shows tolerance ranges represented at each station. Areas with no pollution had fishes representing all resistance levels from 0 to ++++. As adverse elements increased, tolerance ranges narrowed down to the more resistant levels. Thus it may be noted that poorest conditions for welfare of fish occurred in the ditch receiving the broad field effluent at Bayard, along the center towhead in the river at Station 9, and at Station 8. It does not appear wise to assume that waste elements deleterious to these organisms were most concentrated at the above sites, as availability of clean water refuges greatly increased the survival rate and the apparent tolerance of some species. For example, observations indicated that wastes were as thickly concentrated at Station 2R as in the Bayard ditch, but at 2R fully half the river served as an escape area. Nearness of the two uncontaminated drains allowed occurrence of fishes of all tolerance ranges at Station 10. It is suspected that the one red shiner taken at 7L had earlier found a small clean area from which it was drawn to the anode of the electrofishing rig.

The ability of fishes to move into adjecent refuges, and their freedom from Sphaerotilus and silting troubles, gave them greater survival potential than was allowed the majority of benthic animals. However, conditions improved for fishes at Station 6 and 7R, where benthos appeared to have a good chance of survival on November 1, 1961.

Information on the food relationships of the fish population was sought through examination of the digestive tracts of the larger species and some of the most abundant minnows. Since feeding habits noted in Station 1 were repeated in Nine Mile and Wild Horse Drains, it may reasonably be assumed that food utilized at Station 1 was normal for the river at that season (October 30-November 1, 1961). Organisms favored by each species examined were as follows:

Longnose sucker: attached algae and all organisms associated with it. The intestinal tracts of these fishes suggested that they were animated vacuum cleaners, sucking up green algae, diatoms, midge larvae, etc., and many grains of sand. Individuals six inches and longer were examined.

Western white sucker: mostly midge larvae, but

Table 5.
Pollutional Tolerance Ranges Shown By Fishes Collected at Each Station

Station 1	0 → ++++
Station 2L	0 → ++++
Station 2R	++ → ++++
Station 3	++ → ++++
Gering - Mitchell Ditch	0 → ++++
Station 4	++ → ++++
Station 6	+ → ++++
Station 7R	+ → ++++
Station 7L	0 → ++++ (0= one red shiner Otherwise ++ → ++++)
Station 8	+++ → ++++
Station 9*	++ → ++++
Station 10	0 → ++++
Station 10, Drain 1	0 → ++++
Station 10, Drain 2	0 → ++++
Wild Horse	0 → ++++
Nine Mile	0 → ++++

*Sugar beet waste disposal area ditch ++++ only

Along towhead +++ → ++++

also black fly larvae and pupae, caddis larvae, and mayfly nymphs. This species appears to seek out individual organisms. Digestive tracts held no algae, sand, or other extraneous material. Specimens examined were four inches or longer.

Northern creek chub: less than four inches, various small invertebrates, largely oligochaet worms; six inches and longer, smaller fishes.

Common shiner: algae exclusively.

Carp: algae, Potamogeton, and various benthic organisms included with algae. No sand or other extraneous material was observed. Size range four to ten inches.

Stone roller: algae exclusively.

Trout (brown and rainbow): smaller fishes.

Brassy Minnow: algae in one specimen, all others empty. Size range two to four inches.

Northern red horse: all specimens empty. Size range four to eight inches.

Longnose dace: sand and detritus in one specimen, all others empty. Size range two to three inches.

Sand Shiner: none with food in stomach. Sizes examined two to three inches.

It is not assumed that the above food preferences necessarily hold true for all seasons.

Condition of fish stomachs at six stations where varied degrees of pollution existed is shown in Table 6. With the exception of small fishes, natural food was very scarce at all listed stations other than 2L, and it may be assumed longnose and white suckers at Station 2R obtained their food in 2L. Smaller fishes were present to some extent at all stations, and carnivorous species were definitely favored in areas lacking algae and other benthic organisms. The number of empty digestive tracts at Station 3 and below suggests that the majority of species were unable to obtain food in most reaches influenced

Table 6.
Condition of Fish Digestive Tracts at Selected Stations

	Sta. 2L	Sta. 2R	Sta. 3	Sta. 8	Sta. 9	Sta. 10
Longnose sucker	N	N	E	E	-	-
White sucker	N	N	N	E	E	E
Creek chub*	N	N	N	E	N	N
Common shiner	N	-	E	-	-	-
Carp	N	-	E	N**	E	N
Stone roller	N	-	-	-	-	-
Brassy minnow	-	-	E	-	-	E
Red horse	-	E	E	-	E	-
Longnose dace	E	E	E	-	-	-
Sand shiner	E	E	E	E	E	E
Rainbow trout	N	-	-	-	-	-
Brown trout	-	-	-	-	-	N

N = with normal food

E = digestive tracts empty

- = species absent or not examined

*N for this species = smaller fishes at 2R and below

**One *Sphaerotilus* covered mayfly nymph by sugar beet wastes. Some survival of plant life at Station 10 is suggested by Potamogeton in the stomachs of carp, but they may have fed in one of the two clear water drains. Drain 1, in which most fishes were concentrated at that locality, yielded no benthic organisms to collectors on November 2, 1961, and near extinction of its food resources was probably one stimulus behind the movement of fish out into the muddy river.

Some white and longnose suckers taken at Stations 3, 8, 9, and 10 were in poor condition, but other species had not lost noticeable amounts of flesh. Trout found in polluted situations (Stations 2 center, 6, and 10) had recently fed upon smaller fishes and were well fleshed. The rainbow from near center at Station 2 was unpleasantly soft and retained finger pressure marks for a few seconds. Trout in Wild Horse and Nine Mile Drains seemed in good condition.

Welfare of fishes in reaches of the North Platte River contaminated with sugar beet wastes seemed largely dependent upon the presence of various-sized clean water areas in which they could find refuge from time to time or continuously as conditions demanded. Fishes were captured along shore in most areas, and it is suspected that numbers of them were drawn from minute clear water seeps at most polluted stations. This was demonstrably true along the north channel at Station 9. Food supply of most fishes was definitely curtailed or eliminated, and they may have suffered from physical contact with the waste elements. Fish food organisms suffered direct and indirect damages from the waste complex, and Sphaerotilus growths, which proved lethal after attachment to bottom animals, also seemingly rendered areas of bottom unfit for grazing by herbivorous fishes. Longnose suckers were apparently unable to secure any food on bottoms coming under influence of the factory discharges. Trout, which appeared to be the only sport fishes with any potential in this river reach, generally avoided waste-laden water. In their case, direct physical waste effects appear more suspect than food shortage, as their normal autumn food, smaller fishes, survived in all reaches.

The red shiner, stonecat, black bullhead, carp sucker, and gizzard shad appeared unable to long endure contact with the wastes. Only one specimen of large mouth bass was found.

Permissible evaluations of biological damage at this time must relate to the fish population and its basic food organisms. Restriction of fish habitat and reduction or elimination of their elementary food resources were clearly demonstrated. Important areas in fish food relationships that still remain blank are the feeding habits of the smaller minnows (eaten by trout and chubs) and length of starvation period that can be endured by suckers and other herbivorous and insectivorous fishes. Past observations indicate that most blanketing elements originating in the beet wastes are moved on downstream, and recovery of algal growth could be expected soon after close of beet processing. It may reasonably be assumed that herbivorous fishes spread out into the river at that time, even if they are somewhat benumbed by cold water. Fishes normally seeking insects and other invertebrates may still have difficulties, but they may change diets or benefit from a new crop of midges. This is largely speculative. Fish metabolic rate may be low enough in winter to permit extended survival on stored reserves with little or no food intake, or substantial percentages of the population may perish.

Overcrowding of clean drains places great increase in demands on their food supplies, and carrying capacity of such situations is reduced in relation to the extent of overpopulation. Trout habitat is considerably impaired by the wastes, and its potential for expansion appears limited with present operational procedures at the beet plants. All fishery resources are undoubtedly damaged, and recovery of habitat and food supply is only partial in the interval between beet campaigns. Much more varied biotas would be developed if annual destruction by beet wastes could be avoided.

SUMMARY

1. Sugar beet wastes put into the North Platte River at Torrington, Wyoming in late October and early November 1961 contained less suspended sediment and beet parts than they exhibited in November 1960. No fresh accumulations of beet pulp and other fragments were noted anywhere on the bottom in the Torrington, Wyoming, to Bridgeport, Nebraska, reach.

2. Effects of these wastes upon the stream's biota, however, were nearly identical to those noted in 1960. Attached algae and bottom animals were eliminated or severely reduced along the course of waste-laden water, and fish concentration in such areas became quite low. Beet wastes turned into the river in the Scottsbluff, Nebraska, area and at Bayard, Nebraska, induced the same general conditions. Pollution originating in the Mitchell, Nebraska, beet plant had less severe effects at a station 5.3 miles downstream, but it appeared

that some amelioration was accomplished by detention of part of the waste load in an old gravel pit.

3. Survival of fishes was aided by their migration into clean water drains or other tributaries and their retirement into small clear water areas formed by marginal seepage. Food for most species posed quite a problem in areas where benthic algae and animals had been eliminated or where Sphaerotilus growths invested surviving algae. With few exceptions, benthos-feeding fishes had empty digestive tracts in the reach between Station 3 and Bridgeport.

4. The filamentous bacterium Sphaerotilus was greatly stimulated by the elements in the beet factory discharges. It replaced algae on large areas of bottom and its detached fronds and clumps formed a large share of material carried in suspension. It also became attached to various bottom animals.

5. Mortality of benthic animals was occasioned by enveloping growths of Sphaerotilus that fastened upon them and by smothering effects of fine silt deposited by the beet wastes. Algae were eliminated by silting, turbidity induced light reduction, and possibly by competition with Sphaerotilus. They were often blanketed by the bacterium. Benthic animals were eliminated or greatly reduced within thirty days after start of the beet campaign.

6. The fish population clearly suffered restriction of habitat and severe or total reduction of food resources. The only important game fishes, trout, were largely restricted to clear water drains or areas adjacent to the mouths thereof. Only carnivorous fishes enjoyed a stable food supply in the river, and the existence of their prey was threatened by shortages of algae and bottom animals. The full extent of damage is impossible to assess from data now available. The sport fishery was restricted and most of the Torrington-Bridgeport reach was taken out of production of basic fish food organisms. Crowding of fishes into drains and other clean water areas undoubtedly reduced the carrying capacity of such habitats.

May we have the lights. I believe that is all the slides.

We don't know what happens to this fish population as the beet sugar campaign progresses. We don't know what happens to them when the beet sugar wastes are taken out of the river, are no longer discharged into the river. We know that the carnivorous fishes were able to survive in a number of areas and were able to feed in a number of areas where smaller fishes were present, but we do not know upon what these smaller fishes subsisted. We do know that the habitat of the river that supported fish was greatly restricted by the presence of this waste complex from the sugar beet factory, and that these small clear water areas into which these fishes retired to escape these other conditions were overcrowded and their carrying capacity was exceeded. It would appear, then, that the carrying capacity of this river which reaches the river affected by these wastes is restricted largely to the number of fishes that can be maintained within these small clear water areas, drains, and seepage areas, where they can find some fish-feeding organisms.

The fish metabolic rate will decline with cold water, and it is possible that they may have enough stored food reserves within their bodies to carry them over this period when no food is available, or substantial numbers of them may die. We do not know; we have not had the opportunity to study this river at times other than those we did.

I see Mr. Peterson came in. Would you stand up, Mr. Peterson. He helped us with this fish collection.

That is all we have.

CHAIRMAN STEIN: Thank you. Are there any questions or comments?

MR. WILLIAMSON: I might just ask one. If the conclusion could be drawn, I am thinking particularly in the Wyoming section, now, do you feel this year the destruction was due more to turbidity or more to Sphaerotilus?

DR. NEEL: Well, it looked like Sphaerotilus was more instrumental in eradicating them in the regions under the influence of that Torrington beet plant.

CHAIRMAN STEIN: Are there any other questions or comments?

As I understand this, Dr. Neel, and I am just trying to state this in the broadest terms, what happens in the North Platte area is that when the sugar beet campaign begins, due to the growth of Sphaerotilus and the wiping out of fish food, there is a depletion of the fish habitat in the stream, and the fish go into these drains and side ditches and find a place to survive until next year. During that time after the sugar beet campaign, there is a comeback of the stream as far as bottom organisms and fishlife are concerned, but this does not completely come back and then the next campaign reduces it further, and this is an ever-continuing cycle. In the absence of this type of pollution, presumably these fish would proliferate all year round and the ecology would be such as to support a balanced fish habitat?

DR. NEEL: Yes.

CHAIRMAN STEIN: Are there any other questions or comments?

If not, thank you very much for an excellent report, Dr. Neel.

MR. CLARE: Before I introduce the representatives of other Federal agencies who are with us today, I would like to make just three more introductions of Department of Health, Education and Welfare personnel.

I would like to introduce Mr. John G. Detmer, Regional Attorney, Department of Health, Education, and Welfare, in Denver, Region VIII. He was here this morning. I am sorry he isn't here this afternoon.

And Peter Kuh, an attorney on Mr. Stein's staff at headquarters.

MR. KUH: Thank you.

MR. CLARE: And Mr. Frank Kittrell, Chief Engineer in our Field Investigation Section at the Sanitary Engineering Center.

You will recall, Mr. Chairman and Conferees, that at our Scottsbluff Conference Mr. Harold E. Engstrom was representative for the Department of Agriculture and made a statement at that time. We heard from Mr. Engstrom upon sending him an invitation to this Conference, and he indicated he had nothing further to add to the statement previously made, but he reiterated his interest in a cleanup of the North Platte River.

Upon contacting General Shuler, Division Engineer, Missouri River Division of the Corps of Engineers, and the District Engineer, Corps of Engineers, Colonel Woodbury, we were advised that Mr. R. E. McGuire would be with us today representing both the District and the Division of Corps of Engineers. Mr. McGuire, would you have a statement or comment you would like to make at this time?

MR. McGUIRE: I will be very brief. As Mr. Clare just said, I am representing both the Omaha District and the Missouri River Division of the Corps of Engineers. I am here basically as an observer.

A statement was made at the Scottsbluff Conference by Mr. Joseph H. Bennett, and I have nothing to add to that statement, but I would like to repeat one thing that he did say there and that is that the Corps of Engineers is very interested in any and all phases of water resources development.

I regret that I may be unable to stay to the conclusion of this Conference. It has been very enjoyable and very interesting. Thank you.

MR. CLARE: Thank you.

Mr. R. W. Burwell, Regional Director of Fish and Wildlife Service, Bureau of Sport Fisheries, indicated that his office would be represented here today. He also indicated the possibility that Chief Elkins might be in attendance. Is there anyone from the Regional Office of the Fish and Wildlife Service in attendance?

All right. Well, Mr. Tennant is here from the Missouri River Basin Studies, Fish and Wildlife Service. Would you have a comment, please?

MR. TENNANT: No, Mr. Clare. We chose not to make a statement, I guess. I may have some questions later on, I don't know. I have a number of questions that come to mind, but I don't know whether this is the time and place for them or not.

MR. CLARE: Well, fine. We are glad to have you with us. There may be some questions later.

Mr. S. K. Jackson, Division Hydrologist with the Geological Survey, has indicated that Mr. Frank C. Ames, the Branch Area Chief, Quality of Water Resources Division, the Rocky Mountain Area, will represent him, his office today. Mr. Ames.

MR. AMES: Thank you. We do not have any

statement. Mr. Culbertson attended the meeting in September in Scottsbluff and made a statement at that time, which I think covers our interests very well. We would like to reiterate that we are interested very much in all phases of water resources. We would be happy to cooperate any way we can with any of the agencies that are interested in this problem.

MR. CLARE: Mr. R. W. Baker, Regional Director National Park Service at Omaha, has indicated that Mr. Russell McKown, Regional Chief of State Cooperation and Reservoir Planning, will represent him today. Mr. McKown.

MR. McKOWN: My name is Russell McKown. I am from our Regional Two office of the National Park Service, headquarters in Omaha. We cover ten States, all west of the Mississippi, of which both Nebraska and Wyoming are two.

The National Park Service is intensely interested in the problem of pollution as it affects the water resources of our nation.

Obviously, we are concerned in the areas of the National Park System--concerned with keeping the natural lakes and streams free from pollution, and also in providing clean, sanitary water for the using public. Fortunately, many of the parks are near the headwaters of our streams, upstream from cities and industry, so that pollution problems are less severe than those in lower stream basins. In some of the newly authorized areas and in others which have been proposed or are being studied for possible National Park status, pollution is present, however, and of serious concern.

Beyond these direct interests, the Service is deeply involved also. Currently, the nation is experiencing a dramatic increase in outdoor recreation activity, imposing unforeseen pressures on parks and recreation areas everywhere, Federal, State and local. Water is a basic natural resource of the highest importance. Just so, also, water has always been a major park attraction. The present trend in park use, with a strong new accent on boating, is even more in this direction. Now, too, this interest in the enjoyment of the out-of-doors must be considered in the broader context of its part in a way of life and its significance in population shifts and growth; a matter which, in fact, is receiving increasing attention by business and industry. Implicit in this picture is the importance of clean, attractive, unpolluted streams and lakes or man-made reservoirs.

In contrast to this National trend, we appear to be losing ground, losing accesses to these water resources to private ownership, to the inroads of urban and suburban spread, to industrial developments, to irrigation, and to the sharply increasing consumptive uses of all these. To impose pollution on these shrinking resources is a shame which the nation can no longer afford to tolerate.

The National Park Service, in its comprehensive studies, therefore, is giving particular attention to shorelines, to lakes and rivers and reservoirs, to areas of natural significance, such as the Cape Cod National Seashore or the Allagash in Maine and the Current-Eleven Point Rivers in Missouri on which legislation is now before Congress. State studies give consideration also to opportunities for preserving streams and other bodies of water which may warrant administration at the State or local level. In all of these, pollution is a consideration, pollution from sewage and other human and industrial wastes, and also a growing concern for the new and still little understood problem resulting from highly toxic chemicals from detergents which may have serious accumulative effects on the ecology of our streams and lakes. In some cases, pollution already forecloses the opportunity, for the present at least, of providing for human uses of a recreational nature. In many existing bodies of water, it adversely affects the enjoyment of swimming, boating, fishing, and other water sports, not to mention the related though more passive enjoyment of the scene.

Aside from specific sites suitable for parks or recreation areas, there are many sections of our rivers and streams which could provide attractive opportunities as canoe routes or riverways for boating if accessible to the public and if the quality of water were good. In some sections of the country where lakes and reservoirs are not available, the public must turn to the rivers for enjoyment. A good example is the Missouri where it runs between Nebraska and Iowa. Here the river is receiving increased use since the flood potential is now reasonably controlled by upstream reservoirs. But pollution of this stretch, while now getting more earnest attention, is still a major limiting factor for public enjoyment.

The North Platte River is an important waterway, extending as it does along a meandering course through a rather well-populated area in the southeastern part of Wyoming and into Nebraska, through the Scottsbluff area, to its confluence with the South Platte River at the City of North Platte. Along this reach of the river, covering a distance of almost 600 miles, are many good-sized cities, towns, and communities depending upon the North Platte River for recreation opportunities.

As an example of the importance of water use in recreation, the existing six reservoirs on the North Platte River in Wyoming, namely, Seminoe, Kortes, Pathfinder, Alcova, Glendo and Guernsey, and one in Nebraska, Lake McConaughy, are all developed and used quite heavily for recreation. During the year 1960, these reservoirs received 700,000 visitor days of recreation use and enjoyment. A large percentage of this use is some form of water-related activities such as fishing, boating, skiing, or swimming. Clean, unpolluted water is essential to this type of use, which, if present tendency continues, will equal if not exceed demands for other water requirements. Constant vigil should be maintained to give the public attractive, clean water areas where outdoor recreation may be enjoyed to its fullest.

Yes, the National Park Service is very much interested in and concerned about pollution in the North Platte River. As the guardian of our established National Park System areas and as recreational planners on reservoir developments, we feel an important responsibility to join others in adding our voice to the absolute need for clean, unpolluted water. We call attention to this problem as it relates to parks and recreation areas and in the preservation of lakes, streams and other natural water resources for the enjoyment of the public.

CHAIRMAN STEIN: Thank you, Mr. McKown. Are there any comments or questions?

Mr. Clare.

MR. CLARE: The bureau of Mines was represented at the first session of this Conference by Mr. Albert S. Konselman. I should like to re-introduce Mr. Konselman and ask him if he has any further comments to make.

MR. KONSELMAN: Mr. Chairman, Mr. Clare, and gentlemen of the Conference.

There isn't anything that I want to add to the statement I made when I was here last September, except to thank you for inviting the Bureau of Mines to have a representative here again. I might reiterate that we are very much interested in abatement of any pollution, and we are watching the mineral industry, not that we have any police power or any enforcement power, but just for our own satisfaction in seeing that they are taking care of their trash and not dumping it into our streams. I am gratified, really, to note that the mineral industry's conduct is pretty good along those lines.

Thank you.

CHAIRMAN STEIN: Thank you.

MR. CLARE: Region VII of the Bureau of Reclamation was represented at our Scottsbluff session by Mr. J. L. Ogilvie, Assistant Regional Director. Mr. Ogilvie, I would like to re-introduce you and ask you if you have any more comments.

MR. OGILVIE: I will make mine very brief.

Mr. Chairman, Mr. Clare, and members of the committee. I made a complete statement at Scottsbluff earlier, and I am particularly pleased with the progress of the studies that have been accomplished since that time. They will be of great interest to the Bureau of Reclamation, particularly as they relate to some studies that we have in progress, some problems that we have on the North Platte River in the same regions that we have been talking about here today. And, of course, you all know the tremendous values that have been developed along the North Platte River in the form of irrigation developments, and the problems that we are having there now are critical as related to more efficient use of water, which we are trying to stress continually, and to eliminate wastes that would be detrimental to any other purpose, of course, is one of our objectives. We have problems in connection with lining canals, problems in connection with draw down of reservoirs in order to furnish silt to alleviate seepage conditions, and we are scheduling meetings. A meeting will be occurring early this spring, we hope, with the irrigation interests in Wyoming and Nebraska, with the hope that we can resolve some of those problems.

We certainly want to work cooperatively to further enhance the irrigation development, but at the same time to not cause detrimental effects to the other benefits that can accrue in the reaches of the North Platte River.

Thank you.

CHAIRMAN STEIN: Thank you. Are there any questions or comments?

Mr. Clare.

MR. CLARE: I have none, with the exception of--

MR. SAMSON: Pardon me, Herb. Mr. Ogilvie, I was just wondering, you may not wish to comment on this, but are you familiar with the contractual relationship between Bayard and your reclamation district and the irrigation district involving the Bayard ditch?

MR. OGILVIE: I am aware of that, Mr. Samson, but not in minute details. If you want to know what the details of the contract are, I couldn't quote you those details.

MR. SAMSON: There has been some discussion on it that the contract is a burden, and there are some financial arrangements that I have understood were bothersome, and I just wondered, you are not familiar with any of that background on any problem in that area? Has it been discussed with you?

MR. OGILVIE: As far as we are concerned, there is no problem.

MR. SAMSON: Have they ever discussed with you a renegotiation of the contract, ever made an effort to renegotiate the contract?

MR. OGILVIE: No, sir, I am not aware that they have, although they could very well have done that with our Casper office.

MR. SAMSON: Would that be handled in Casper rather than out of your office?

MR. OGILVIE: That is where the initial contact would be made.

MR. SAMSON: Is that a trilateral contract there? I mean is it the irrigation district and the reclamation district and the Town of Bayard that is involved in that, or is that--

MR. OGILVIE: I am not sure, but I am of the opinion that it is the City of Bayard and the Bureau of Reclamation.

MR. SAMSON: I see.

MR. OGILVIE: But the third party might be in it.

MR. SAMSON: All right. Thank you.

CHAIRMAN STEIN: Mr. Clare.

MR. CLARE: With the exception of one more, Mr. Fitzpatrick, whom I indicated this morning we would like to call on, I believe this concludes the introduction of representatives of Federal agencies. Have I overlooked anyone?

If not, Mr. Joseph W. Fitzpatrick, Chief of the Water Quality Section in our regional office in Denver, and representing the Regional Program Director Water Supply and Pollution Control, I wonder if you have some comments you would like to make at this time.

MR. FITZPATRICK: Mr. Chairman, Mr. Clare, we have no prepared statement. We have been very impressed with the presentations here today and the interest shown by the States and participants in the Conference, and would like to say that our regional program stands ready to assist in any way on this matter.

Thank you.

MR. CLARE: I believe that is all.

CHAIRMAN STEIN: Thank you, Mr. Clare.

We would like to call on the State of Nebraska now, Dr. Rogers.

DR. ROGERS: Mr. Chairman, ladies and gentlemen.

I would like to take my prerogative in introducing some people from Nebraska also. You have already met Mr. Filipi, so I won't ask him to stand again. I will only point out that in addition to being Director of the Section of Environmental Health in our Nebraska State Health Department, he now and for the past several years has had another assignment, namely, Secretary to the Nebraska Water Pollution Control Council.

We have two members of our Water Pollution Control Council here today. One is at the Conference table with us. We will hear from him next. But we also have a representative of a food processing industry, namely, the Great Western Sugar Beet Company, who is a member of our Water Pollution Control Council and who is in attendance. This is Mr. Harold D. Burk, from Scottsbluff. Will you stand up, Harold.

MR. BURK: Thank you, Dr. Rogers. I would like to introduce Lloyd Jensen, our Vice President of Operations of the Great Western Sugar Company, who is with me, from Denver.

DR. ROGERS: Thank you, Mr. Burk. I was going to ask him, if he hadn't volunteered, to introduce Mr. Jensen, because he is not from Nebraska, or from the State Health Department of Nebraska. I believe he also has another assignment which is pertinent to the field of discussion here today, does he not? Is he on the National Task Force of Industrial Wastes that was established within the Department of Health, Education, and Welfare?

MR. BURK: Yes.

DR. ROGERS: We are glad that you could be here today.

Mr. Chairman, I have no prepared statement to make today to supplement what was presented at the previous session of this Conference. As to remarks or information, I merely point out that we do have a continuing interest in the problem of pollution control on the North Platte River and other streams in our State. We are watching the developments with great interest on this stretch of the stream.

We point out that in the short interval of time since the last session of this Conference in September of 1961 a considerable amount of progress has been made toward the ultimate correction of the pollution of this stretch of the stream. We will watch with great interest what is accomplished upstream in our sister State of Wyoming, not only because it will contribute to better quality of water entering Nebraska, but also because it will point the way that might help us in correcting the pollution problems in our section of the stream.

With that, I think I will defer to the Chairman of our Nebraska Water Pollution Control Council, Mr. Samson.

MR. SAMSON: As the Chairman of the Nebraska Water Pollution Control Council, I will say that we are happy to be here to work out on a Conference basis what appears to be a problem involving the pollution and degradation of the interstate waters, that is the Platte River. I wish, and I say this very sincerely, to work out this problem on a fair, reasonable, and equitable basis, and I say to you again that this must be the premise upon which we are to proceed.

I have no prepared statement. Our position, that is the State of Nebraska, was clearly set out in the proceeding at Scottsbluff, Nebraska, on September 12, 1961, and remains the same now. The transcript of that hearing accurately sets out what occurred there, and so that pretty definitely sets out the position of the State in that connection.

Mr. Chairman, to proceed and to act arbitrarily now or at any later time on this sort of a matter would defeat the very purposes for which the legislation and the law was intended. I have a feeling, however, that in this Conference procedure, with the cooperative efforts being worked out by all of the interested parties, all the involved parties, and this includes industry, the State of Wyoming, the State of Nebraska, the Federal Government, and all of the political subdivisions, that the end result which we are all striving for will be attained, and that is the abatement of the discharge of industrial and other wastes into the Platte River, be it in Wyoming, Nebraska, or any place else, and that with the construction of adequate waste treatment facilities installed in Wyoming, if that is the case, or elsewhere, to abate pollution of the river as it crosses the State line, that we will have accomplished something.

The actions which have been going on here and at Scottsbluff and elsewhere, of course, has already reflected itself generally up and down the Platte River, not only here but also in Nebraska, as far as new or contemplated installations of waste treatment facilities are concerned. An example, a very outstanding example, of this is the tremendous progress that was made across the State line in Scottsbluff. Ted Filipi can fill you in on what happened at Scottsbluff in the last three or four months and the progress which has been made down there. We are real proud of that in Nebraska.

It was agreed at the Scottsbluff hearing that there be further investigation with additional evidence, if additional evidence was necessary, before an intelligent and a reasonable conclusion could be arrived at, and so the Public Health Service was designated to work in cooperation with the municipalities and the involved industries to conduct an investigation and a study of the river during the 1961 and the 1962 sugar beet campaign to obtain bacteriological, biological, chemical, stream flow, and to obtain other pertinent data to properly assess the sources of industrial and municipal wastes, the kinds of coliform bacteria present in the river and their effects on water quality. I am informed that this work has proceeded nicely, and I am very happy about that. I understand that the cooperation and the working arrangement has been good between the Health Service and the various State political subdivisions, as well as the States and industries, and that that study has been pretty much completed. So far today I think that we have been considerably enlightened. I think in that type of an atmosphere, we can get the job done.

Thank you very much, Mr. Chairman.

CHAIRMAN STEIN: Thank you. Are there any questions or comments?

I would like to ask you one, Mr. Samson. With relation to Scottsbluff, are they contemplating putting in some sewage treatment?

MR. SAMSON: Mr. Filipi, shall we turn you loose for five minutes or would you like to talk further on that?

MR. FILIPI: What is the desire of the Council?

MR. SAMSON: Yes, would you discuss that with Mr. Stein, the Scottsbluff situation.

MR. FILIPI: The program of eliminating pollution from the rivers of Nebraska is progressing in an admirable manner. As you know, within the last five years some eighty sewage treating plants were constructed in our State. Consequently, we have several rivers that have no untreated sewage discharged therein, namely the Republican River, the entire Blue River, and with the exception of two communities on the Missouri there is no untreated sewage. Omaha has a plant under construction now, and it is our intention that by 1963 it will be finished with no untreated sewage being discharged therein.

As far as the program is concerned, we proceeded along river basins. The North Platte River was of interest to the Nebraska Water Pollution Control Council. Consequently, conferences were held with municipalities on the North Platte River, and it was our intention that the community creating the most pollution should be the first to show action. This is Scottsbluff, Nebraska, and we are proud to report that the plans and specifications of the Scottsbluff waste water treating plant are now in our office, and we are asking that Scottsbluff defer advertising for bids because we would like to have a chance to review those plans. But Scottsbluff is so anxious to move right now that they actually are telephoning in twice a week to see if the plans are ready for release.

We are having a meeting with the municipal officials of Gering tomorrow for the same purpose. Gering, as you know, is arranging a program with the Swift and Company packing house to work out this program.

Other communities along the North Platte River, such as Lyman, Henry, Minatare, Broadwater, and Mitchell, have already conferred with their engineers for the purpose of preparing programs that will lead to plans that will eliminate the undesirable discharge of wastes. As you know, Nebraska has set the goal of 1966, at which time we will have no untreated sewage being discharged into our streams, and it is amazing that with not one exception our municipal officials have adopted this and agreed to follow the recommendations of the council. So, therefore, we are anticipating a wonderful progress report to give to any person who will be so kind to ask for it yearly because of the attitude that Nebraska citizens have taken toward this project.

We are also very proud to report the way industry is cooperating with the Water Pollution Control Council. At no time did we have any opposition voiced by industry, and these, too, are setting up programs that will lead to plans, and the year 1966 is still active in the minds of our entire citizenry in achieving this objective.

CHAIRMAN STEIN: Thank you, Mr. Filipi. Do you know what the size of the bond issue will be in Scottsbluff?

MR. FILIPI: I thought--Mr. Burk, will you correct me?--it was about $800,000, was it not?

MR. BURK: We have $50,000.

MR. FILIPI: No, no, the bond issue at Scottsbluff.

MR. BURK: Oh, the bond issue?

MR. FILIPI: At Scottsbluff.

MR. BURK: Is $850,000.

CHAIRMAN STEIN: Is that primary treatment or further?

MR. FILIPI: It is going to be a waste stabilization lagoon, which is equivalent to secondary treatment.

CHAIRMAN STEIN: Have they applied for a Federal grant?

MR. FILIPI: Yes, sir. And the Federal grant, they have their offer, they have accepted the offer, and--

CHAIRMAN STEIN: Then they have been awarded the grant?

MR. FILIPI: Yes, sir.

CHAIRMAN STEIN: Have any of these other communities along here been offered Public Health Service grants?

MR. FILIPI: No, sir. They did not make application because Scottsbluff appeared to be the--let's see, what word do I want to use there?

DR. ROGERS: Primary target?

MR. FILIPI: The primary target. And when Scottsbluff gets moving, then the rest of them will start. I dislike the word "target" because it appears that we were just shooting at them, and we weren't.

CHAIRMAN STEIN: No, the figure we have used, the figure of speech we have used, and this is typical all over the country, is like the olive and the nugget, when the big community goes, all the others follow.

Thank you, Mr. Filipi.

Do you have any more, Dr. Rogers, from Nebraska?

DR. ROGERS: I don't know of any. Does anyone else from Nebraska wish to make a statement? We have sent out a number of invitations and heard from some of them. If there is anyone else here from Nebraska who would like to make a statement, I would like to invite them to do so at the present time.

Apparently not, Mr. Chairman.

CHAIRMAN STEIN: If not, we would like to call on Wyoming. Mr. Williamson.

MR. WILLIAMSON: Well, we have a number of people, since introductions are in order, from Wyoming. I might run down the list, at least the ones I know that are here.

We have several members of our Stream Pollution Control Advisory Council present. Our present Chairman, Mr. Christensen, is on my right here. In the audience we have Frank Long, the Vice Chairman; Past Chairman, Mr. John Peryam; Ken Day; Earl Burwell; and I believe Mr. Kirk has a representative here, Mr. Engendorff, I see. If you gentlemen will stand up as members of our Pollution Control Advisory Council, they can at least see who is present here. We don't have too many additional representatives from the State offices.

I believe we also have a representative from Senator Hickey's office and also a representative from Senator Gale McGee's office. If those two gentlemen are here, would you please stand up and be identified? I think both of those offices had an observer present.

What is the name here, Rooney?

MR. ROONEY: Rooney.

MR. WILLIAMSON: Mr. Rooney from Senator Hickey's office.

And we have representation from the Holly Sugar Corporation, Messrs. Hanson, Croghan, Browning, and Russell Ludwig, their Consulting Engineer. If you gentlemen will stand up so we can see you, we will have a comment from you in a few minutes.

I would just like to make a little observation, then we will ask for the other comment here, reiterating very much the position of the State Health Department in this particular instance as stated at Scottsbluff. We have had a program of waste treatment worked out with the Holly Sugar Corporation. Our treatment methods were designed primarily to improve the physical aspects of this stretch of the stream. We wish to remove the gross material that was objectionable to sight, and we wish to remove as much turbidity and suspended solids as possible, as we felt that these were probably causing the major portion of the trouble in this stretch of the stream. We were not particularly worried about BOD at this time, because it was not depleting oxygen in Wyoming. We did not know what the effect was below, so that was what the study was to bring out. We can say that Holly Sugar has complied with all of our requests in approving or improving the treatment insofar as the physical aspects go.

I think the results today, particularly from Joe Neel's report, indicate that maybe we were successful in removing quite a bit of the turbidity of the stream, but in so doing we may have compounded another problem. In the past we didn't have Sphaerotilus, and we had a lot of turbidity. This year we got rid of the turbidity; now we have got Sphaerotilus. So where are we? We solved one problem, but brought up another.

But I think this was our position in this thing, and I think here is where we have our meeting ground as to the quality of water everybody wants. We know what we are shooting for, but we have to have agreement with everyone on this.

I think with that bit of comment, I would like to have Holly Sugar present any material which they would like to, any statements they wish to make at this time.

Mr. Browning, do you wish to lead off?

MR. BROWNING: Mr. Williamson and Mr. Chairman, our representative here today is a qualified Sanitary Engineer, Mr. Russell Ludwig, and we have elected him to present our position at this time.

Mr. Ludwig.

MR. LUDWIG: Mr. Chairman and gentlemen. We were asked in January of this year to study the waste disposal problem for the Holly Sugar Company at Torrington, and have subsequently prepared a report, of which we have printed copies and distributed to some of you. We have additional copies available of the same report if someone else desires one. I am going to go through our report first, and then add some additional comments at the end.

This report is entitled, "Report on Waste Disposal Facilities, Holly Sugar Corporation, Torrington, Wyoming."

CHAIRMAN STEIN: Mr. Ludwig, it might be advisable, if you have enough extra copies of that, to hand them up here for the Conferees to follow.

MR. LUDWIG: Surely.

MR. SAMSON: Do you have any objection, Mr. Ludwig?

MR. LUDWIG: No.

First, as an introduction, to go back just a little bit, perhaps some of this will be repetitive to many of you, but I will read it as it is written.

The Holly Sugar Corporation beet sugar factory at Torrington, Wyoming, which includes both straight house and Steffen house operations, processes approximately 3,000 tons of beets per day during a season running from mid-October into January of the following year.

Up until 1954, all factory wastes were discharged to the North Platte River. During the period from 1954 through 1961, numerous improvements have been made at the Torrington factory to reduce the quantities of suspended solids, BOD, and lime waste entering the river.

Waste disposal operations during the 1961-62 season are summarized as follows:

(a) All Steffen house waste and lime slurry wastes are now pumped to evaporation and percolation ponds. None of these wastes enter the river (there is no overflow from the ponds). There is a cattle feeding operation on the plant site, but no drainage from this area reaches the river, as it is percolated into the ground several hundred yards from the stream.

(b) Factory wastes still discharged to the river are: (1) Flume water, including condenser water. The latter is once used fresh well water, plus the condensate from the evaporators and pans; (2) Pulp screen water, including screened water from silo drainage; and (3) Effluent from the plant septic tank.

(2) Evaluation of Existing Test Data

Pollution surveys of the North Platte River in the vicinity of the Holly Sugar Corporation factory at Torrington were carried out by the U. S. Public Health Service during 1950, during the campaign of 1960-61, and during the campaign of 1961-62. Additional sampling and analyses of the plant waters and of the river have been performed by the State of Wyoming and by the Holly Sugar Corporation.

A study of the existing survey data, combined with considerations of basic data on waste quantities and characteristics for the beet sugar industry (as reported by Hayse H. Black and G. N. McDermott), and of the particular features of the Torrington factory (including the several waste disposal modifications already installed), leads to a very confusing picture.

Based on the stream studies of 1960-61, a BOD discharge of 20 pounds per ton of beets was estimated for the Torrington plant. This estimate is considerably higher than that which would be similarly calculated from the 1950 data--even though the Steffen waste and lime slurry (which usually represent 45 percent of the total BOD) had been completely removed in the interim period. The BOD data based on actual plant waste analyses performed by the Public Health Service and the State of Wyoming during the 1961-62 campaign similarly would indicate a discharge of 32-35 pounds per ton of beets processed even though additional measures had been installed between the 1960-61 and 1961-62 campaigns to effect significant removal of solids.

Comparison of river BOD analyses at the State line as taken from the Holly Sugar Corporation files with similar data of the Public Health Service indicates variations of 100 percent for samples taken on identical days.

In summary, although since 1954 complete removal of Steffen waste and lime slurry has been accomplished and in addition some 50 or more tons of vegetable matter (beet particles, leaves, weeds and pulp) removed from the remaining waste, the waste analyses appear to indicate a substantial increase in discharged waste BOD per ton of beets. It is possible that frozen and/or spoiled sugar beets could account for a portion of the discrepancy. In addition, it is conceivable that the recirculation of pulp silo drainage screenings back to the silo could substantially increase the silo drainage water BOD. However, it is our conclusion that the overall discrepancy is due not only to such complicating factors but also to improper comparisons and possibly to inadequate sampling procedures

Similar confusion results when attempts are made to analyze the suspended solids and bacteria data.

(3) Analysis of Present Position of Holly Sugar Co.

Consideration has been given to all possible means of economically reducing waste discharge loadings at the Torrington plant. Although adequate data is not available to independently analyze the several waste flows at this particular plant, it has been deemed reasonable to assume that individual waste characteristics will simulate those determined for the industry at large. In particular it is considered reasonable to assume that the flume water at the Torrington plant will closely resemble that considered normal for beet sugar factories. Whereas it is conceivable that pulp screening water and/or pulp silo drainage water may well vary considerably from plant to plant, flume water should be of reasonably consistent nature as to BOD, suspended solids, etc.

Analysis of the water uses and resulting waste flows at the Torrington plant indicates that, of the total present waste discharge of 9.1 million gallons a day, about 7 to 7.5 million gallons a day is flume water and the remainder is of pulp screening and silo drainage origin. (Septic tank effluent volume is relatively insignificant.)

Basic waste analysis data of the beet sugar industry indicate that the BOD of flume water is in the range of 150-250 parts per million, resulting in a waste load of from 3.7 to 4.5 pounds of BOD per ton of beets. The remaining BOD load as experienced at the Torrington plant must result from the combination of pulp screening water and pulp silo underdrainage.

(4) Proposed Solution to Waste Disposal Problem

Based on the several considerations enumerated above, the proposed solution to the problem of waste disposal at the Torrington factory of the Holly Sugar Corporation is as follows:

(a) Provide pumping facilities and accompanying pipelines to deliver all pulp screening water and pulp silo drainage water to the existing lime slurry and Steffen waste ponds. Overflow from the ponds is to be delivered to adjacent percolation ponds for final disposal with no overflow to the North Platte River. It is believed that the ponds presently in operation at Torrington will adequately provide for this waste disposal operation for the 1962-63 season. The Holly Sugar Corporation has been able very recently to acquire additional land adjacent to the present holdings, which land will be sufficient to handle the flows mentioned on a permanent basis.

(b) Septic tank effluent now entering the waste discharge system is to be re-piped to connect with one of the pumping systems which now deliver wastes to the disposal ponds. This connection, combined with the provisions of (a) above, will eliminate all objectionable bacterial contamination of the river.

(c) Flume water will remain as the sole waste water to be discharged to the river.

(d) Also during the 1961-62 campaign, considerable difficulty was experienced at the revolving drum screen facility recently installed in the final waste line. The removal of the pulp screening water and pulp silo underflow drainage, as proposed above, will permit these screens to efficiently handle the final waste discharge. Some further modification of this installation is planned, based on the 1961-62 experience, to assure ample capacity at all flow rates, using the 40 mesh, .0164-inch net opening screens.

(5) Summary

(a) Considerable progress has been made by the Holly Sugar Corporation toward elimination of pollution of the North Platte River during the period of 1954-61.

(b) Present waste discharge analyses indicate, in spite of the many improvements already made, that objectionable quantities of BOD and bacteria are still entering the river during the beet sugar campaign.

(c) Rational analysis of the many data available at the Torrington plant, including basic data reported in the literature on wastes for the beet sugar industry, indicates that the objectionable loading of the remaining waste discharge stems primarily from pulp screening water and pulp silo underdrainage. The total volume of this waste portion is estimated in the neighborhood of 1.6 million gallons a day, as compared with the total waste discharge of about 9.1 million gallons a day.

(d) Porous land areas are available near the plant to permit disposal by percolation of all pulp screening water and pulp silo drainage wastes, so that none of these flows need be discharged to the river.

(e) Septic tank effluent, although small in volume, can easily be removed from the waste discharge and added to the percolation system.

(f) After removal of the pulp screening water, pulp silo drainage water, and septic tank effluent, the final waste discharge will consist entirely of flume water. Basic data of the beet sugar industry indicate that the resulting BOD loading will be in the range of 3.7 to 4.5 pounds of BOD per ton of beets. This is based on a waste volume of from 2,200 to 2,600 gallons per ton of beets and a BOD concentration of from 200 to 210 parts per million. Also, removal of the pulp screening and pulp silo wastes from the final discharge will eliminate all objectionable bacteria and in addition will improve the operation of the final effluent drum screens now in use at the Torrington plant.

It is believed that final effluent discharge will not cause objectionable BOD, suspended solids, or bacterial loadings in the North Platte River.

(6) Recommendations

(a) Based on the considerations enumerated above, it is our recommendation that the Holly Sugar Corporation proceed with the construction of the necessary pumping, pipeline, ponding, and percolation facilities to provide for land disposal of the present pulp screening, silo drainage, and septic tank effluent discharges.

A sampling and analysis program should be planned for the coming 1962-63 campaign to provide the company with adequate BOD, suspended solids, and bacterial data of the resulting flume water discharge.

(b) The Holly Sugar Corporation position on waste disposal should be presented to the Public Health Service at the forthcoming continuation of the Conference on Pollution of Interstate Waters of the North Platte River, with the stipulation that all other beet sugar factories discharging to the North Platte River are to concurrently meet similar waste discharge requirements.

In reviewing our own thinking in terms of the data that was reported here today, it is our belief that--well, first, it was our desire in an attempt to analyze the problem at Torrington to have more data, but unfortunately at the time we were called into this problem the factory was shut down, so it was impossible or not possible to actually analyze the various wastes that are being produced at the plant. As far as we could determine, no one had made any analyses of anything other than the final composited waste discharge.

We further believe that there is one process carried on at the Torrington plant, namely the recirculation of the drainage water from the pulp silo back to the silo, that very well could have resulted in increased BOD loadings per ton of beets over the entire period of study. This factor becomes of significance when you analyze the basic data according to the basic data of the beet sugar industry as reported by Hayse Black. And considering the particular features of the Torrington plant and the amount of Steffens waste handled there, you would calculate that perhaps the total BOD per ton of beets of all wastes is in the neighborhood of 35 pounds per ton. You will note that in our studies or in our report that the studies would indicate that after removal of the Steffens waste and lime waste that perhaps the BOD had been reduced down to 20 pounds per ton of beets. However, that figure was based on analyses made in the river and not analyses made of the waste itself.

The more recent analyses made by both the Public Health Service and the State of Wyoming, which analyses agreed very closely, would indicate that we are back up to 32 to 35 pounds per ton of beets in spite of the fact that some 50 or more percent of the BOD has been removed. Now, this is what I was getting to when I said this is a confusing picture, and because we don't have individual waste constituent analyses, it is only possible to speculate as to why this is so. As I say, it is very probable that the pulp silo underflow at the Torrington plant is very high in BOD, higher than that reported in the literature. However, we feel, in view of the program that we propose for Holly Sugar, that this is merely academic, because whatever the BOD of this pulp silo underflow is and whatever the BOD of the pulp screening water is, we are going to remove it from the river and are only going to release as a discharge to the river the flume water, to which, as I stated in the report, we feel the basic beet sugar data will apply.

The same thing applies to all the considerations that were mentioned this morning with regard to bacteria, both the fecal coliform and fecal strep, that it is pretty obvious that if, in fact, the Holly Sugar Plant is producing quantities of fecal coliforms and quantities of fecal strep--and since we have not made any analyses or done any work on this ourselves, we will have to accept the data as factual--that even if this is so, in view of the program that we propose for Holly Sugar, again it is merely academic, because we know that if this is so, these fecal coliforms and fecal strep are resulting from either the septic tank effluent discharge or the underflow from the pulp silo, again, which conceivably could be, as Art Williamson has pointed out, more or less incubating the bacteria. But since these wastes are going to be removed from the system regardless of what they now have, we have assured ourselves in our own thinking that the resulting bacteria loading will be very, very low. In addition, as Mr. Clark pointed out, with the cleaning up of the waste itself in terms of organic loading, those few remaining bacteria will find it a little more difficult to survive in the river.

Now, the last data would indicate, the last BOD data would indicate, that the combined Holly Sugar Company waste contains somewhere in the neighborhood of 1,400 parts per million of BOD. The basic data of the industry would indicate that the flume water conceivably would have somewhere in the neighborhood of 200 to 210 parts per million of BOD. As you gentlemen can easily see, this would result in a reduction of 85 percent of the BOD, which we feel is more or less equivalent to secondary treatment in a waste treatment operation when you get up in the 85 to 90 percent range.

So based on these basic facts, we present this program as the program of the Holly Sugar Company, and I would like to call upon Mr. Browning as a representative of the Holly Sugar Company to indicate what steps the company itself has taken and to enlighten you on their particular interest in the matter.

CHAIRMAN STEIN: Right. Well, we may have some questions first.

MR. LUDWIG: All right. Fine.

CHAIRMAN STEIN: Are there any questions? I may have one.

MR. SAMSON: Mr. Ludwig, I just have an observation to make. I think this is a very commendable approach to a rather difficult problem, and I think it is a nice report and a good step forward.

Now, I was just wondering, are you in a position to report the overall cost of this program?

MR. LUDWIG: Mr. Browning will report on that.

MR. SAMSON: I was interested in what it would amount to in dollars and cents. I think it would be interesting to know.

MR. LUDWIG: Yes. He is going to report on that.

MR. SAMSON: Thank you very much.

CHAIRMAN STEIN: Mr. Ludwig, as I understand this, considering the proposed analysis, is it the intention to put these remedial measures in operation for the coming winter's beet campaign?

MR. LUDWIG: This is my understanding. Mr. Browning can report on this also as to what part is--

CHAIRMAN STEIN: I think we are largely interested in the time schedule here and when this is going to be accomplished. I think if this is going to be put in for this campaign, it is certainly, it seems to me, a reasonable proposal.

I think we might have a space or two that we might want to clarify on the sampling and analysis program for the coming 1962-1963 season, and I will do this for a moment on the assumption that these remedial measures are going to be put in this winter, because I think any sampling and analysis program next winter without putting these in will just review what we found this time, maybe with a few refinements. Generally speaking, we would like to see what a lot of States do, and that is the industry to employ competent people in the field of waste treatment and sanitary engineering and water pollution control to do the surveying for them. We have every faith in the professional reputation of these firms, and we think they can do it.

We would like for you to, perhaps if you could, Mr. Ludwig, give us the scope of what you would consider a monitoring program like this to be, and then perhaps when Mr. Browning speaks he can indicate whether he is considering having a private engineering firm do that. The alternative to that would be for the Government to undertake that itself, and our preference, it may very well be the industry's preference, would be to have, if possible, private consulting firms well recognized in the field to do this rather than have the Government to do this, because, as I say, reading your report, we are well satisfied with that.

I might make one more point, Mr. Ludwig, before you go into that. I was bothered by the discrepancies when I read your report and the other report too. Unfortunately, Mr. Hayse Black couldn't be here; he is in Florida today on another industrial problem. I asked him about this, and his explanation was that these industrial wastes surveys were based on estimates, while what we actually had in the North Platte River were actual stream conditions, and he believed he would go with these stream conditions. Now, again I am just speaking for myself, I thoroughly agree with you, there may be a great variation in silo drainage and the other parts of the waste. I don't think there is necessarily this discrepancy in estimates made on flume water discharge. And I think if that is eliminated, you should have it.

Before you go on with any outline of what you might think a sampling and anelysis and monitoring program should be, I think we have one further operation. I don't know how well this technique is known in analyzing fecal streptococci and fecal coliform bacteria, but if for some reason these should still keep appearing after these works are done, there may be a point in having Mr. Clark look into that and try to outline what the source is, because at the present time we can only surmise where that is coming from. I go along with Mr. Williamson. My guess is his, that we may have an incubation chamber in the silo drainage, and just having a little seepage of perhaps even one pipe flowing in there might cause all this problem. I don't know.

But you may outline, if you would, the sampling and analysis program, and possibly the Government may still have to enter the situation if we have fecal streptococci and fecal coliform bacteria.

MR. LUDWIG: Yes. First on your other point, we puzzled over these analyses figures for some time. As we got into the considerations of what the company might do, it became apparent, as I previously said, that the most of the confusion was merely academic and that we could proceed with the plan we had, because we are going to eliminate all of the confusion.

We had given only a limited amount of thought to a monitoring program. In the first place, this thought was given after we had written this report. The analyses that we had called for in the recommendations of our report would serve as a part of such a monitoring program, that is the suitable analyses of the resulting plant waste itself both as to BOD, suspended solids, and bacteria. It would seem appropriate to have a reasonable monitoring program in addition on the stream much in line with the work that has been done by the Service to date, and this is one of the things that I have discussed with Mr. Browning and we are going to try to work out and possibly enlist the help of the State people in Wyoming. The program wouldn't have to be a complex one, in my opinion. We could set up the program to sample the river above and the river below the waste discharge.

And incidentally, one of the other things that we have proposed for the Sugar Company that didn't get into our report because we didn't know just how it might be accomplished was to get a better distribution of the resulting waste flow into the stream to eliminate the effect that your people brought out of it running down one bank for miles until it did get distributed in the stream. This would permit the analyses of the samples that were taken from the river to mean more, to be more representative, because I know in talking with the Holly Sugar Corporation people, in running their own samples of the river they found this to be quite a problem. You go up the stream and you don't know, you have to more or less composite your own sample because the waste is only a part of the river, so you don't know really what you have got. Of course, with the most of the BOD and solids taken out of the stream, this problem will be minimized, too, if some better distribution can be arranged.

But, anyway, it was our preliminary thinking that if the river above the waste discharge and the river below the waste discharge was sampled and analyses for BOD, suspended solids, dissolved oxygen, and turbidity made, as well as the data in our report for the waste discharged, that this could go a long way toward presenting the picture of what is actually happening during the campaign. Possibly these samples could be run every two weeks or at some suitable period to get a representative group of samples, because the campaign does go on for approximately one hundred days.

That is what I had in mind as a monitoring program.

CHAIRMAN STEIN: Thank you very much. Are there any further questions?

Thank you. Would you have Mr. Browning come up?

MR. LUDWIG: I would like to call on Mr. Browning to present the answers to your other questions.

MR. BROWNING: I can say that we have accepted the Engineering-Science Company's report, and I have authorization from our principles, my management, to proceed along the lines of this report exactly.

We currently are engineering how we can do it. Our preliminary estimate is rather shocking because in total we will spend just under $100,000.

MR. SAMSON: I didn't hear you, Mr. Browning. How much?

MR. BROWNING: Just under $100,000. Half of it for the land, which was just acquired last week, and the rest of it on pipeline, pumps, tanks, and the essential paraphernalia to get the water up to our spreading grounds, ponds.

We were very happy last year with the fact that we had cooperated with the State of Wyoming and had won something of a victory when we got their approval last December to the effect that the water we were putting out to Nebraska was satisfactory to the State of Wyoming, but Mr. Samson and some of his people in Nebraska didn't see it that way, so we had no more gotten out of one dilemma than we were right into another one. Before we went on spending money as we have--we are now in well over $200,000 in our waste program--we thought we had better employ some professional talent. There are some problems, which Mr. Ludwig mentioned, which we intend to monitor.

My idea of a monitoring program is one that would be statistically satisfactory to whoever wants to read it and monitor what we are doing, whether or not we engage professional talent. We very probably will, on account of the impartiality necessary, but so far in Wyoming these facilities are rather limited. We are going to discuss this with Mr. Williamson and several other people; we might even go to the Colorado State University. But we will assure you now that whatever data we collect will be acceptable.

Any further questions?

CHAIRMAN STEIN: Yes. The first question, this is a key question. Taking Mr. Ludwig's recommendations for the remedial facilities, additional remedial facilities, in dealing with keeping pumps, silo drainage, and septic tank effluent discharges from the stream, and the improvement of the screening system, can we expect that to be in operation by the next campaign?

MR. BROWNING: No question about it. We will have that. As a matter of fact, we are already engineering it. There are no insurmountable problems. All we are going to do now to eliminate any engineering project is to work out the most economical way of doing it. We will have plans available to be worked on by the time frost is out of the ground and we are ready to go.

It will be definitely in effect by the next campaign, yes, in total. No part of it will be left out.

CHAIRMAN STEIN: Thank you very much.

MR. SAMSON: Mr. Browning, I just wanted to clear up a matter. I mean you seem to single me out as the instigator of this whole thing, but--

MR. BROWNING: You are from Nebraska, aren't you?

MR. SAMSON: I am perfectly willing to assume that responsibility. But I think I ought to clear up a misapprehension. The first time that I heard about this problem was from some eminent citizens from the State of Wyoming, but it is immaterial as far as I am concerned, Mr. Browning.

You were talking about the costs here, and I think that you are probably familiar with the Anaconda Copper problem up at Anaconda in Butte, Montana?

MR. BROWNING: Oh, yes.

MR. SAMSON: I think that company expended--what was it?--over eight or nine million dollars on the problems involving industrial and human waste.

MR. BROWNING: We are just a poor little sugar company. We don't gross anything like the hundreds of millions of dollars they do.

MR. SAMSON: I can appreciate that. But I mean it is a problem wherever you turn.

MR. BROWNING: Absolutely.

MR. SAMSON: We had the pleasure of spending an entire day with the Western Electric Company near Omaha, and that company--of course it is a big company--has expended over one million dollars in one plant for the taking care of the discharge of human and industrial waste. And then Wilson and Company, a packing house, is constructing a packing plant in western Iowa, and they are incorporating right in their operation a complete treatment facility.

But I do realize the economic impact of this thing, and we are trying to approach it on a sensible and decent basis.

MR. BROWNING: We are not in this case pleading that we are poor or that we abhor expenditure on waste disposal any more than anybody else, and, as you say, it is a relative matter. But the question was asked how much we thought we would spend on it, and I answered the question.

MR. SAMSON: Yes, I appreciate that. I thought it would be of interest. Thank you very much.

MR. BROWNING: Yes, sir.

CHAIRMAN STEIN: Mr. Williamson, anything further from Wyoming?

MR. WILLIAMSON: I don't have anybody scheduled. Do any members of the Pollution Council out here have any comments, or are there any other people from Wyoming who would like to add anything at this particular time?

I think we will probably ask Chris here for his comments, if he wants to make some statement and observation on this as to Council policy.

MR. CHRISTENSEN: Well, yes, I might.

You understand, Mr. Chairman, that Wyoming has been involved in several of these deals, and this is not by a longshot the end of it. I believe that we have improved the condition on the North Platte River considerably, and I appreciate Mr. Samson's remark as to what is being done in Nebraska farther down. I know that they are capable of doing a great deal with their water and to improve the Platte River itself. I personally witnessed them down at Scottsbluff two years ago turn water into gasoline, and if they can do that they can surely purify it some more.

It has been stated from Holly what they intend to do in improving the industrial side of this problem. I would really request that Nebraska withdraw their complaint at the present time and give us a chance to work on some of the other States or let them work on us. Montana is breathing down our collar now, and we have that to face, with the understanding we furnish water for two thirds of the population of the United States and they expect it to be clean out of Wyoming like Coors Beer. We intend to do that.

We want to do the best we can, and I believe that we have made an honest and good effort, and I think Nebraska should be satisfied.

MR. SAMSON: Well, in direct answer to your question, Mr. Christensen, about withdrawing the complaint, I would be unalterably opposed to such a position now. I feel that this matter has been resolved and been worked out as a result of this Conference and that we should proceed from there.

CHAIRMAN STEIN: I think we are pretty close to a satisfactory settlement.

Let me go off the record for one minute.

(Off the record)

CHAIRMAN STEIN: Some members of the Board asked that before we summarize we may have a five-minute adjournment. Now, I want to place the issues as I see them here and possibly add some proposals.

One, I think the studies this past year have substantially confirmed the recommendations and conclusions made by the Conferees at the first session of the Conference in Scottsbluff, and probably it is in order to incorporate those in the second session.

Again I suggest that we might consider accepting the Holly Sugar Corporation proposal to proceed with the necessary pumping,pipeline pumping, and percolation ponds to provide for land disposal or its equivalent in keeping the wastes out of the stream of present pulp screening, silo drainage, and septic tank discharges, and to improve the screening so it can efficiently handle the final waste discharged. We would also recommend that all the companies involved here should engage on a sampling and analysis and monitoring program for the coming 1962-63 campaign. We would hope that we could work it out with reputable consulting firms and with the States involved and, if they wish, with our Department, although we are not looking for this. We would hope you would do this on your own.

This should include, but not be limited to, dissolved oxygen, BOD analysis, suspended solids, bacteriological data, and other pertinent data.

Now, I think we recognize that the Federal Government has an obligation here, and I think we should have information that the monitoring, sampling, and analysis program is going forward, with the details of that, by August 1, 1962, so if this is not going forward the Federal Government can make its own arrangements. I also think that the remedial facilities which we outlined above should be in operation by the beginning of the 1962-63 sugar beet campaign.

Also I think the comment is well taken about Nebraska. I think that the industries in Nebraska should have a commensurate program operating in that State, because again we are faced with the problem that if we are going to protect the water uses in Nebraska, and Wyoming is going to deliver that water to Nebraska, there is no point in them delivering a water of a suitable quality for a variety of uses if it is not going to be taken care of down in that State. In addition to that, I think Nebraska should come forward with a plan, and I know they are proceeding to provide adequate treatment for its municipal wastes, and I think again by this same August 1st deadline Nebraska should be able to provide both the State of

Wyoming and the Public Health Service with a time schedule for the completion of the municipal waste treatment facilities in the State of Nebraska on the river. This is in accordance with the Nebraska program for a reasonable and orderly way of cleaning up the municipal wastes. However, I think the proposal is that the industrial wastes in Nebraska should proceed in accordance with the same time schedule that the Holly Sugar Company has proposed: that is, installation of this type of remedial facility or its equivalent by the beginning of this season, and the installation of a sampling, analysis, and monitoring program, preferably by a private organization, and in cooperation with the State to notify the Public Health Service or our Department by August 1st so we can see what we are going to do about that.

Now, again, if--and I would just add one point; I think we are all seeking this one together--if after this, after the remedial works are put in and the monitoring program indicates the possibility of fecal streptococci or fecal coliform, that it might be wise for the States and the industries to consider calling upon the Public Health Service. As a matter of fact, part of the monitoring program might call for Mr. Clark and his group to come out here once the remedial facilities are in just to check and see if that is corrected, as I have every confidence it will be, so we could write that off.

I have every confidence in the report of Mr. Ludwig and their engineers that the situation will be corrected, but hopefully these are the proposals we would like to present to the Conferees. We will adjourn for five minutes and see if there is--

MR. SAMSON: I think that a little adjournment is fine, but I would like to clear up the last two lines on page 7 of the Ludwig report on beet sugar factories, that other beet sugar factories discharging to the Platte River concurrently meet similar waste discharge requirements. I am wondering, I don't know, possibly Mr. Jensen could after the recess do some enlightening on that.

MR. JENSEN: I can do it now or later if you want.

MR. SAMSON: Would you mind doing it right after the recess? Thank you.

(RECESS)

CHAIRMAN STEIN: The Conference is reconvened.

At the present time we would like just to recap the summary of the Conference, and if there are any suggestions or modifications from the Conferees, we will entertain them after I have recapped the summary.

The Conferees,after consideration of the results of the investigation and the statements here, reconfirm their recommendations and conclusions of the first Conference and recommend that the Holly Sugar Company of Torrington, Wyoming, proceed with the construction of the necessary pumping, pipeline, ponding and percolation facilities to provide for land disposal or otherwise keep out of the Platte River present pulp screening, silo draining, and septic tank effluent, and also provide sufficient screening to handle final waste discharges; that this company inaugurate a sampling and analysis program for the coming 1962-63 campaign to provide adequate data, including dissolved oxygen, BOD, suspended solids and bacterial data; that the remedial facilities be put in, installed and operating by the coming 1962-63 campaign; and that the Conferees recommend that the State of Nebraska engage on a voluntary effective pollution abatement program in the State of Nebraska concerning the municipal and industrial wastes in the State affecting the water quality of the North Platte River; and that the--

MR. SAMSON: Are you including the entire North Platte River in that?

CHAIRMAN STEIN: No, the North Platte River covered by the report in this Conference, not the entire river.

MR. SAMSON: Restricted, then, to what area?

CHAIRMAN STEIN: What was the lowest point mentioned in your report, Mr. Sidio?

MR. SIDIO: The lowest?

CHAIRMAN STEIN: How far down did you go in your report?

MR. SIDIO: Broadwater.

CHAIRMAN STEIN: Down to Broadwater. And that the State of Nebraska advise the State of Wyoming and the Public

Health Service by August 1st as to the nature of the program.

Is that a fair statement of the summary?

MR. SAMSON: Let me say in connection with the matter involving the Platte River within the State of Nebraska that that matter did not and does not come within the purview of this Conference, which is a continued Conference from the Conference held at Scottsbluff, that the matter that the Conferees came into hearing on was a request by the State of Nebraska to the Surgeon General as it involved the pollution of the North Platte River at the border of Wyoming and Nebraska, that there has been no evidence in any manner, way, shape, or form in connection with time schedules or dates or any matter in that connection as it might involve those towns, municipalities, and industries within the State of Nebraska on the Platte River in the area that you have just referred to, Mr. Chairman, and that those situations as they would involve the area on the Platte River in Nebraska certainly didn't come within the purview of the Conferees. I think that clears up--

CHAIRMAN STEIN: We recognize that, and I think that was pointed out right at the beginning of the first Conference. Unless the Governor of Nebraska requests us, the Federal Government has no jurisdiction over the pollution sources in Nebraska affecting people in Nebraska. However, what we are seeking here is an equitable solution to a problem.

MR. SAMSON: That situation doesn't come into being either as far as this Conference is concerned under Public Law 660.

CHAIRMAN STEIN: Well, I don't know that it doesn't come into being as it comes under Public Law 660, if you want to have a discussion of that here. This is always the problem we have where a stream is not the border between two States, such as the Mississippi and the Missouri, where the stream flows from one State into another State.

Now, I don't know what the Secretary would do, but I think we would have a very serious problem if we were to ask one State to provide a quality of water at a State line and when it goes over the border not be interested as to what happens. This proceeding and the entire proceeding is pervaded by the spirit of the equity proceeding. I don't think we can look for relief here except if anyone comes in with clean hands.

I think we also have to consider the abatement of water pollution control on a river basin basis. That has been said in the consideration of the legislation in Congressional reports and professional meetings for many, many years. And I frankly don't know of any other way to approach this but on a river basin basis.

MR. SAMSON: Of course, the statute sets out very clearly what the procedure shall be, and if you get into the problem of the situation as it involves Nebraska and the Platte River within Nebraska, it would have to come into being by virtue of the law under which we operate, and that would have to be by either a complaint by the Governor of Nebraska or the Governor of any other State or of the State Water Pollution Control agency.

CHAIRMAN STEIN: We recognize that, and that is what we--

MR. SAMSON: I am not trying to hedge on anything.

CHAIRMAN STEIN: That is right. When we asked for a voluntary effective program on the part of Nebraska, we recognized that. This is something that we are asking Nebraska to do on a voluntary basis, recognizing that we don't have jurisdiction. We also, I think, should have the recognition that on the basis of what Nebraska would do on a voluntary basis would considerably affect what we in good conscience could ask sources of pollution in Wyoming to do, and we would fully state on the basis of the statute that we didn't have any jurisdiction in the absence of a request from the Governor of Nebraska over pollution sources in Nebraska. But if you think we should indicate that in the summary, we will be glad to say that, recognizing the situation, although I thought we did that when we used the word "voluntary."

DR. ROGERS: That would be satisfactory to me. We have given every indication, both in the previous hearing and in this one, of our interest in continuing our efforts to abate the pollution of the North Platte River below the point where it enters the State of Nebraska. We have shown considerable progress to date and look forward to more progress in the future. We have a program already under way with a time schedule. We see no objection to having set this forth and presenting it to the State of Wyoming and the Public Health

Service by August 1st.

CHAIRMAN STEIN: I might say this, and this is paradoxical, when you sit down like this about the table in a pollution case. I would say that both your States have among the best State programs in water pollution control. I don't think either one of you has anything to be ashamed of. This is one of the residual and tough problems in both your States. Wyoming has done a magnificent job over the years. And I think, considering the problem they have, since Nebraska really got a water pollution control law with teeth in it, Nebraska has made as much progress as any State in the Union. I don't think there is any doubt about it.

We have full faith in a voluntary, effective program in the State of Nebraska. I am sure your sister State of Wyoming has that. And I think if we didn't have faith in each other, we wouldn't be sitting around the table.

MR. SAMSON: Murray, you know personally how I feel about this whole situation. I mean I think it ought to be cleaned up on a fair, on an equitable, and on a respectable basis, doing equity to all. Possibly the matter I brought up was highly technical, and, of course, you have these technical devices in these statutes for the protection of everyone. We have had a full-fledged hearing on the situation here involving Wyoming and their little problem they had here, and apparently it has been resolved. For the protection of everybody, you have these provisions put in the statutes.

I tried to familiarize myself with the situation in Nebraska and elsewhere, by virtue of the fact that I am on the Water Pollution Control Advisory Council to the Secretary of Health, Education, and Welfare, and I am somewhat at a loss to state to you about these time schedules, and so forth, as they involve these municipalities and the industries in Nebraska. I don't know what their problems are, and the record is absolutely devoid of anything in connection with schedules, dates, and so forth, as it involves those situations in Nebraska, you see.

CHAIRMAN STEIN: I think we have two problems or three, if we analyze them. One, I don't know that time schedules for municipalities anywhere, whether they were in Wyoming or Nebraska, are necessarily the same as time schedules for industries. There is a different problem. There is the question of municipal financing and voting. This is a question that you work on.

As I understand it from Mr. Filipi's statement and your statement, the situation at Scottsbluff looks as if it is on the way to solution, and as we have seen up and down the streams of this country and right on your own streams, on the Republican and on the Big Blue River, on the Missouri River, once the big town goes, everyone goes. Here you have your big town on its way, and I don't think, knowing the Nebraska program, you are going to have any problem.

Now, the question with the industries, all I think the Conferees have recommended is that on a voluntary basis you let the State of Wyoming and us know by August 1st what the program is in Nebraska.

MR. SAMSON: In that connection, I see Lloyd sitting out there, and he was going to make some statement or had some information that might be helpful.

Would you care to make some remarks, Mr. Jensen?

MR. JENSEN: I didn't necessarily intend to make a statement today. I don't have a formal statement. But since the issue has been raised regarding the program that has been planned by Great Western Sugar Company in Nebraska, I will take this opportunity to tell you what has been done and what we propose doing.

It has been suggested, of course, that we follow the plan that Holly has outlined for their plant at Torrington. I might state that we don't have any pulp screen water going into the river now, so that problem is solved. We do not have any pulp silo drainage going into the river from three of our factories now. We have one plant that has pulp silo drainage, and that is the Scottsbluff plant. We authorized about six weeks ago the expenditure of something over $40,000 to build a treatment system at the Scottsbluff factory. This cost of $40,000 does not include the approximately 200 acres of land that will be taken out of other uses for this purpose. I think if you add the value of that land to the cost of the facilities that you will find it is quite a sizable expenditure.

While I am here, I do want to comment a little on Mr. Ludwig's talk, and I agree with him in his statement that he couldn't quite understand some of the relationships that have occurred regarding the stream conditions in 1961 as compared to 1950. I think I talked about this at the Scottsbluff meeting, but in 1950 we were treating practically none of our wastes in the North Platte valley. Since that time, I think I could demonstrate to any technical man or anyone else that we have removed over 50 percent of the pollutional material that was going into the river. Now, whether there are synergistic effects or not, I don't know. I don't know what the problem is, I don't want to challenge the validity of anybody's report, but this is the fact and I don't understand it.

As far as the sanitary sewage is concerned, there doesn't seem to be much point in us doing much about that when municipalities are dumping raw sewage into the river. I think this will follow, that any time a municipality gets a sewage treatment plant we will, of course, make arrangements, if we can, to put our sanitary wastes in their plant. That has been our program in other States.

Any questions?

MR. SAMSON: Are there any questions?

MR. CHRISTENSEN: No. But then, of course, you understand, we are not reaching for any high grapes. The reference to the Great Western Sugar plant was made at the end of the report by Holly, not from the Wyoming Council. However, it would seem senseless to deliver clear water into a cesspool. We are merely asking that you go along and clean up your municipalities so that for the good of the people down through there we feel that the sacrifices that we have made will not be nullified for the people in general. I don't want that to sound socialistic, but--

MR. JENSEN: Mr. Christensen, I would like to go on record here and state on behalf of Great Western Sugar Company, we are against pollution too, and I think we recognize a responsibility here and I think nearly everything we have accomplished so far has been done voluntarily. I am not trying to hang any ribbons on us, because we certainly have a lot left to do, not only in Nebraska but in Colorado and a few other places. I don't want to see any kind of condition develop between Great Western Sugar Company and Holly. We are in the same boat, and I am not trying to put them on the spot and I hope they are not trying to put us on the spot. This is not a matter of--

CHAIRMAN STEIN: Well, we would hope not.

I might say I left one thing out, and this is obvious, I think, that at the end of the next campaign I think all the parties will have to sit down and evaluate what has been done. I would sincerely hope that this is the last Conference. We are not looking for any more on the North Platte River, and I think if the reports are correct and Mr. Ludwig's analysis is correct, it may very well be that this is the last Conference. But we will evaluate this thing again after this and hope we will be able to proceed.

I think, again, what we have from here on out, if we can agree on the summary we have outlined here, is getting our technical staffs together, exchanging information, and hoping that the companies involved will be prepared not only to put in the appropriate remedial works required by the State agencies, but will engage competent firms to perhaps do some monitoring, so we can rely on the monitoring and come up with what I would consider a relatively clean bill of health for the North Platte River. I think we are on the verge of that now, and I don't think we should hesitate, but go ahead. I think we are pretty lucky here in having one situation which is very amenable to solution with just a little more extra work and a little extra good will on both sides.

MR. SAMSON: Well, I think, Mr. Chairman, on the premise which you have just stated, that the Secretary is with--by the Secretary I am referring to the Secretary of Health, Education, and Welfare--that this Conference has convened here or has adjourned from Scottsbluff, and that the Secretary is absolutely without jurisdiction as far as any problem in Nebraska is concerned and that those problems be handled on a voluntary basis with some type of a report, if possible, by August 1st, that we can proceed. Is my premise correct?

CHAIRMAN STEIN: Is everyone agreeable to that?

All right, we will proceed with that.

Does anyone else want to say anything at the present time?

If not, I would like to thank you all for coming and participating. The Conference stands adjourned. I hope we are adjourned permanently.

MR. SAMSON: May I inquire as to an extension, if further time is required to report to you on the voluntary progress we have made, you will give it your due consideration?

CHAIRMAN STEIN: That is right.

MR. SAMSON: Thank you.

CHAIRMAN STEIN: Thank you. The Conference is adjourned.

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REPORTER'S CERTIFICATE

I, Virginia Hough Rankin, do hereby certify that I was present at the time and place first hereinbefore set forth, the aforementioned parties appearing, that I took down in shorthand the entire proceedings had at said time and place, afterwards transcribed said shorthand notes, and that the foregoing 139 pages constitute a true, correct, and complete transcript of my said shorthand notes.

Virginia Hough Rankin
Virginia Hough Rankin
Shorthand Reporter

6005 East 93rd Street
Kansas City, Missouri

APPENDIX A

RESULTS OF INDIVIDUAL SAMPLES

NORTH PLATTE RIVER SURVEY
WYOMING – NEBRASKA
SEPTEMBER & NOVEMBER 1961
RESULTS OF ANALYSES

STATION 1 (NP208.6)

Month	Date	Sample Time	Temp. °C	D.O. mg/l	B.O.D. mg/l	Susp. Solids mg/l	Volatile Susp. Solids mg/l	pH	Alkal. Phenol mg/l (as $CaCO_3$)	Alkal. Total mg/l (as $CaCO_3$)	Cl^- mg/l	Hard. mg/l	Ca. mg/l	Mg. mg/l	Specf. Conduct. µmhos/cm.	True Color Units	Turb. Units	Coli. M.P.N. Per 100 ml.	Fecal Coli M.P.N. Per 100 ml.	Fecal Strep. Per 100 ml.
9	22	08 00A	10	8.58	1.22	25.0	6.0	8.0	0	184	17.1	306	200	106	666	8	*25			50
9	23	11 15A	12	9.23	1.16	18.0	15.0	8.3	0	187	17.3	310	203	107	657	8	*25	3,300	2,300	38
9	24	07 50A	10	8.71	0.96	22.0	4.0	8.1	0	182	16.9	302	200	102	690	8	*25	1,300	*200	75
9	25	10 00A	12	9.30	1.29	15.5	5.5	8.1	0	195	16.1	298	203	95	705	5	*25	50	20	17
9	26	11 45A	14	9.10	2.67	14.5	9.5	8.2	0	196	14.2	298	215	83	725	5	*25	40	*20	4
9	27	11 25A	15	9.34	1.83	17.0	11.0	8.2	0	206	16.3	300	204	96	720	8	*25	130	20	22
9	28	08 30A	10	8.98	1.30	11.5	0.0	8.1	0	197	16.4	301	204	97	720	8	*25	80	70	19
AV			12	9.03	1.50	17.6	7.3	8.1	0	192	16.2	302	204	98	697	7	*25	800	*438	32
11	07	07 40A	04	10.23	0.95	19.6	9.6	8.1	0			306			690	7	*25	80	50	70
11	08	11 03A	06	11.10	1.00	5.6		8.2	0			299			725	8	*25	70	20	50
11	09	06 50A	04	9.78	1.41	21.2	1.6	8.1	0	176		306			705	7	*25	110	50	43
11	10	10 30A	07	10.54	0.80	6.0	2.0	8.3	0	174		298			741	4	*25	*20	*20	48
11	11	06 35A	05	9.39	1.07	4.4	4.0	8.1	0	175		304			700	7	*25	20	*20	108
11	12	10 00A	06	10.71	1.12	10.0	4.8	8.2	0	176		302			666	7	*25	50	50	38
11	13	07 00A	04	10.18	1.00	8.8	0.4	8.1	0	176		300			770	7	*25	70	20	240
11	14	10 25A	04	11.21	0.83	3.2	2.8	8.1	0	174		300			752	7	*25	70	*20	44
11	15	07 05A	04	10.00	0.50	5.7	4.0	8.0	0	176		297			705	7	*25	80	50	124
11	16	03 35P	C5	12.00	1.51	4.4	4.4	8.2	0	170		292			690	7	*25	*20	*20	26
11	17	12 50P	04	11.57	0.91	6.5	6.5	8.0	0	174		297			668	7	*25	50	*20	1,400
11	18	09 30A	04	10.89	1.11	9.7	6.3	8.1	0	174		300			690	7	*25	80	*20	150
11	19	03 15A	03	10.10	1.00	9.0	9.0	8.1	0	173		297			741	3	*25	50	50	102
11	20	05 10A	01	10.58	0.95	10.7	10.7	8.1	0	174		299			683	7	*25	110	20	140
AV			4	10.6	1.0	8.9	5.1	8.2	0	174		300			710	7	*25	70	39	170

* Indicates less than

NORTH PLATTE RIVER SURVEY
WYOMING - NEBRASKA
SEPTEMBER & NOVEMBER 1961
RESULTS OF ANALYSES

STATION 2 (NP199.0)

Month	Date	Sample Time	Temp °C	D.O. mg/l	B.O.D. mg/l	Susp. Solids mg/l	Volatile Susp. Solids mg/l	pH	Alkal. Phenol mg/l (as CaCO3)	Alkal. Total mg/l (as CaCO3)	Cl⁻ mg/l	Hard. mg/l	Ca. mg/l	Mg. mg/l	Spect. Conduct µmhos/cm.	True Color Units	Turb. Units	Coli. M.P.N. Per 100 ml.	Fecal Coli M.P.N. Per 100 ml	Fecal Strep Per 100 ml.
9	22	08 30A	10	8.95	1.41	27.0	4.0	8.0	0	196	18.4	298	196	102	700	9	30			470
9	23	10 35A	11	9.41	1.09	30.0	16.0	8.2	0	198	18.0	305	188	117	680	9	25	1,400	400	120
9	24	08 20A	10	8.99	1.24	25.0	4.0	8.2	0	194	17.7	302	188	114	715	10	30	10,900	1,400	290
9	25	10 25A	11	9.69	2.11	17.5	6.5	8.1	0	206	17.5	299	203	96	752	6	*25	1,300	*200	46
9	26	12 10P	14	9.60	2.39	19.5	10.5	8.2	0	214	19.8	302	198	104	764	8	*25	330	80	20
9	27	11 55A	14	9.81	1.56	29.0	22.0	8.3	0	213	17.1	304	197	107	752	7	*25	230	80	8
9	28	08 50A	10	9.34	1.25	10.0	5.5	8.3	0	213	17.3	301	156	145	770	9	*25	1,720	130	74
AV			11	9.39	1.6	22.6	9.7	8.1	0	204	17.9	301	186	112	733	8	*26	2,600	*348	146
11	07	08 20A	4	8.38	52.4	56.	22.	7.9	0			300			740	16	40	130,000	11,000	1,700,000
11	08	10 32A	6	8.50	41.1	63.	25.	8.0	0			304			834	13	35	221,000	3,300	390,000
11	09	07 20A	4	7.75	44.5	96.	31.	7.9	0	197		302			775	13	40	240,000	7,000	3,300,000
11	10	09 00A	6	7.60	47.1	43.	5.	8.0	0	196		299			832	13	40	172,000	2,000	1,500,000
11	11	07 05A	6	6.42	52.9	55.	28.	7.9	0	197		300			769	14	55	278,000	2,000	2,300,000
11	12	09 35A	6	7.89	49.7	60.	24.	8.0	0	196		302			769	16	45	141,000	8,000	3,400,000
11	13	07 30A	4	8.21	44.6	61.	21.	8.0	0	197		293			848	14	50	79,000	2,000	400,000
11	14	09 35A	4	8.51	44.7	71.	27.	7.8	0	196		300			763	13	65	175,000	2,000	940,000
11	15	07 35A	4	7.90	55.4	59.	27.	7.9	0	196		295			807	13	45	130,000	*2,000	600,000
11	16	3 00P	4	8.90	61.2	76.	37.	8.0	0	200		296			790	13	55	33,000	*2,000	260,000
11	17	01 20P	4	8.64	61.8	49.	28.	7.8	0	199		301			770	13	45	172,000	8,000	340,000
11	18	09 00A	3	8.54	46.8	90.	37.	7.8	0	198		300			690	14	40	490,000	*2,000	1,250,000
11	19	03 40A	3	8.01	46.6	85.	54.	7.8	0	199		294			840	14	50	49,000	2,000	8,000
11	20	04 40A	1	8.41	75.4	74.	44.	8.0	0	194		297			683	14	55	330,000	*2,000	3,500,000
AV			4	8.1	48.4	67.0	29.2	7.9	0	197		298			779	14	47	88,571	4,730	1,477,142

* Indicates less than

NORTH PLATTE RIVER SURVEY
WYOMING - NEBRASKA
SEPTEMBER & NOVEMBER 1961
RESULTS OF ANALYSES

STATION 1 (N104-1)

Month	Date	Sample Time	Temp °C	D.O. mg/l	B.O.D. mg/l	Susp. Solids mg/l	Volatile Susp. Solids mg/l	pH	Alkal. Phenol mg/l as CaCO3	Alkal. Total mg/l as CaCO3	Cl− mg/l	Hard. mg/l	Ca. mg/l	Mg. mg/l	Spec. Conduct µmhos/cm.	True Color Units	Turb. Units	Coli. M.P.N. Per 100 ml.	Fecal Coli M.P.N. Per 100 ml.	Fecal Strep. Per 100 ml.
9	22	09 10A	09	8.98																8,600
9	23	10 10A	10	10.06														11,000	*2,000	670
9	24	08 40A	10	9.41														22,000	2,000	670
9	25	10 50A	11	10.31														54,200	1,400	400
9	26	12 30P	15	9.91	2.82	75.0	18.0	8.4	5.2	416	31.8	178	128	50	1235	28	100	10,900	10,900	260
9	27	12 15P	14	10.18	2.56	67.0	23.0	8.5	8.0	416	31.8	178	116	62	1220	26	75	7,000	4,900	150
9	28	09 10A	10	9.72	1.94	60.0	9.0	8.4	4.0	416	31.5	172	112	60	1250	28	85	4,900	900	260
AV			11	9.80	2.44	67.	17.	8.4	5.7	416	31.7	176	118	56	1235	27	87	18,300	3,700	1600
11	07	08 35A	2	11.76	1.97	58.	16.	8.4	0.8			180			1180	24	70	7,000	2,300	2,300
11	08	10 09A	2	12.28	1.82	68.	11.	8.4	1.4			179			1390	22	65	24,000	*200	2,200
11	09	07 40A	2	11.00	2.08	86.	1.	8.4	1.0	353		176			1282	23	70	17,200	3,300	1,100
11	10	08 40A	2	11.26	1.04	79.	5.	8.4	2.2	350		178			1370	22	70	10,900	800	1,700
11	11	07 25A	2	10.54	1.30	45.	9.	8.4	2.2	353		178			1281	23	80	7,900	2,400	3,700
11	12	09 15A	4	11.34	1.51	56.	15.	8.4	3.8	352		178			1250	22	55	2,300	1,300	2,700
11	13	07 55A	2	10.27	1.32	325.	60.	8.3	0	354		179			1390	22	60	79,000	800	210,000
11	14	09 10A	1	12.19	2.15	58.	19.	8.4	2.0	355		176			1281	22	55	4,900	1,300	1,160
11	15	08 00A	2	11.27	1.01	68.	16.	8.3	0	356		174			1266	22	60	4,900	800	1,000
11	16	02 40P	3	13.10	3.00	48.	6.	8.4	4.2	343		177			1750	22	55	13,000	1,400	290,000
11	17	01 40P	3	12.60	2.50	63.	30.	8.4	3.2	353		172			1265	22	60	33,000	17,200	1,800
11	18	08 35A	1	11.77	2.24	87.	24.	8.3	0	352		171			1281	22	75	13,000	1,700	4,200
11	19	04 05A	1	11.13	2.95	161.	34.	8.3	0	357		177			1370	21	120	49,000	4,900	8,000
11	20	04 15A	1		1.78	84.	43.	8.3	0	365		188			1333	19	75	10,900	4,900	2,300
AV			2	11.7	1.9	91.8	20.6	8.3	1.4	354		177			1335	22	69	14,707	3,300	38,001

* Indicates less than

NORTH PLATTE RIVER SURVEY
WYOMING - NEBRASKA
SEPTEMBER & NOVEMBER 1961
RESULTS OF ANALYSES
STATION 4 (NP101.6)

Month	Date	Sample Time	Temp °C	D.O. mg/l	B.O.D. mg/l	Susp. Solids mg/l	Volatile Susp. Solids mg/l	pH	Alkal. Phenol mg/l (as CaCO3)	Alkal. Total mg/l (as CaCO3)	Cl⁻ mg/l	Hard. mg/l	Ca. mg/l	Mg. mg/l	Specf. Conduct. μmhos/cm.	True Color Units	Turb. Units	Coll. M.P.N. Per 100 ml.	Fecal Coli M.P.N. Per 100 ml.	Fecal Strep Per 100 ml.
9	22	09 35A	10	8.60	2.07	120.	6.0	8.2	0	339	27.0	238	156	82	953	26	160			4,700
9	23	09 45A	11	9.23	1.38	34.0	9.0	8.2	0	331	25.8	246	153	93	925	22	55	17,000	5,000	1,210
9	24	09 00A	09	8.88	0.97	88.0	5.0	8.2	0	332	24.7	255	170	85	990	13	50	*2,000	*2,000	640
9	25	11 15A	13	9.69	2.89	46.0	15.0	8.3	0	346	26.8	241	170	71	1052	13	45	4,900	800	230
9	26	01 00P	15	7.93	2.89	184.	17.0	8.2	0	282	13.5	273	122	151	769	17	360	34,800	2,100	800
9	27	12 35P	15	9.48	2.61	61.0	29.0	8.3	0	311	22.9	253	169	84	925	13	45	3,300	500	190
9	28	09 25A	11	9.08	1.60	111.	22.0	8.2	0	253	16.4	265	183	82	820	9	75	5,420	790	150
AV			12	8.98	2.06	92.	14.	8.2	0	313	22.4	253	160	92	919	16	112	11,200	1,900	1,100
11	07	08 50A	4	8.93	23.8	48.	13.	8.0	0			289			710	12	40	49,000	2,000	1,060,000
11	08	09 50A	4	8.92	22.2	56.	17.	8.0	0			290			840	12	35	27,000	4,000	390,000
11	09	07 55A	4	8.29	20.4	154.	17.	8.0	0	204		288			781	13	35	330,000	2,000	700,000
11	10	08 20A	6	7.99	20.9	122.	14.	8.0	0	204		286			861	13	55	172,000	2,000	130,000
11	11	07 45A	6	7.69	22.5	40.	9.	8.0	0	206		287			782	14	40	79,000	*2,000	1,600,000
11	12	08 55A	6	8.27	22.6	58.	18.	8.0	0	200		288			769	12	30	109,000	*2,000	740,000
11	13	08 15A	4	9.03	25.	55.	22.	8.0	0	208		288			870	12	35	63,000	5,000	1,830,000
11	14	08 50A	3	9.15	22.7	84.	20.	8.1	0	187		284			725	9	35	141,000	*2,000	180,000
11	15	08 20A	4	8.44	22.1	62.	25.	7.9	0	203		287			781	11	35	33,000	*2,000	720,000
11	16	02 20P	4	9.36	34.	77.	30.	7.9	0	207		289			800	12	50	33,000	*2,000	290,000
11	17	01 55P	4	8.51	38.1	104.	31.	7.9	0	214		290			832	14	65	130,000	*2,000	290,000
11	18	08 15A	3	8.84	26.3	99.	14.	7.9	0	206		287			819	13	50	79,000	*2,000	630,000
11	19	04 20A	2	8.46	31.1	106.	41.	7.9	0	213		291			854	14	65	12,000	*2,000	420,000
11	20	03 55A	2	8.62	30.4	102.	41.	8.0	0	217		289			813	13	50	130,000	*2,000	870,000
AV			4	8.6	26.5	83.3	22.2	8.0	0	205		288			803	12	44	99,071	2,140	703,571

* Indicates less than

NORTH PLATTE RIVER SURVEY
WYOMING - NEBRASKA
SEPTEMBER & NOVEMBER 1961
RESULTS OF ANALYSES

STATION 5 (NP184)

Month	Date	Sample Time	Temp. °C	D.O. mg/l	B.O.D. mg/l	Susp. Solids mg/l	Volatile Susp Solids mg/l	pH	Alkal. Phenol mg/l (as $CaCo_3$)	Alkal. Total mg/l (as $CaCo_3$)	Cl^- mg/l	Hard. mg/l	Ca. mg/l	Mg. mg/l	Spect. Conduct. µmhos/cm.	True Color Units	Turb. Units	Coli. M.P.N. Per 100 ml.	Fecal Coli M.P.N. Per 100 ml.	Fecal Strep. Per 100 ml.
9	22	10 00A	10	8.89	1.69	38.0	14.0	8.1	0	307	22.1	258	158	100	869	12	60			1,360
9	23	09 15A	11	9.37	1.18	19.0	11.0	8.1	0	310	21.7	267	118	149	840	14	25	17,200	4,900	900
9	24	09 25A	10	8.52	1.25	26.0	7.0	8.0	0	292	19.6	280	155	125	847	8	25	13,000	7,900	570
9	25	11 40A	14	10.13	2.43	20.0	9.0	8.2	0	291	21.0	278	192	86	901	9	25	1,300	500	90
9	26	01 20P	15	9.66	3.07	384.	46.	8.4	1.8	254	19.3	283	210	73	820	14	50	1,300	220	160
9	27	01 00P	15	9.53	2.94	41.0	8.0	8.4	2.0	256	19.3	278	193	85	820	12	35	10,900	490	280
9	28	09 50A	12	9.10	1.71	56.0	5.0	8.2	0	257	19.2	277	183	94	827	12	45	3,480	2,400	860
AV			12	9.45	2.04	83.4	7.4	8.2	0	241	20.3	287	172	101	846	11	37	7,900	2,700	740
11	07	09 30A	5	8.90	34.9	45.	17.	8.0	0			291			720	13	30	79,000	11,000	212,000
11	08	09 00A	4	8.83	14.2	50.	23.	8.1	0			293			826	13	30	49,000	*2,000	150,000
11	09	08 40A	5	8.40	16.1	188.	11.	8.0	0	208		290			775	12	30	33,000	1,400	130,000
11	10	07 45A	6	7.98	11.5	172.	20.	8.0	0	207		290			855	12	35	79,000	2,300	270,000
11	11	08 25A	6	7.90	16.8	47.	15.	8.0	0	206		289			769	12	30	79,000	500	220,000
11	12	08 15A	6	8.11	17.	51.	42.	8.0	0	206		289			781	11	25	240,000	2,300	450,000
11	13	08 55A	5	8.69	14.8	225.	20.	8.0	0	206		286			840	13	25	221,000	800	160,000
11	14	08 10A	3	8.87	14.6	57.	22.	8.0	0	206		288			769	8	35	70,000	800	490,000
11	15	09 05A	4	8.60	15.8	62.	32.	7.9	0	202		290			807	12	30	33,000	4,900	128,000
11	16	01 45A	4	9.39	24.4	139.	37.	7.9	0	207		287			819	12	75	79,000	800	200,000
11	17	02 45P	4	8.99	25.8	101.	26.	7.9	0	208		292			781	13	60	109,000	1,300	470,000
11	18	07 35A	3	8.96	20.6	129.	20.	7.9	0	206		287			807	12	40	109,000	800	620,000
11	19	04 50A	3	8.66	22.7	145.	36.	7.9	0	208		289			825	9	70	172,000	2,300	106,000
11	20	03 30A	3	8.68	25.9	98.	28.	8.0	0	208		290			787	14	45	70,000	2,700	90,000
AV			4	8.7	19.65	107.8	26.4	8.0	0	206		289			797	12	40	101,571	2,453	264,000

* Indicates less than

NORTH PLATTE RIVER SURVEY
WYOMING – NEBRASKA
SEPTEMBER & NOVEMBER 1961
RESULTS OF ANALYSES
STATION 6 (NP180.5)

Month	Date	Sample Time	Temp. °C	D.O. mg/l	B.O.D. mg/l	Susp. Solids mg/l	Volatile Susp. Solids mg/l	pH	Alkal. Phenol mg/l (as $CaCo_3$)	Alkal. Total mg/l (as $CaCo_3$)	Cl^- mg/l	Hard. mg/l	Ca. mg/l	Mg. mg/l	Specf. Conduct. µmhos/cm.	True Color Units	Turb. Units	Coli. M.P.N. Per 100 ml.	Fecal Coli M.P.N. Per 100 ml.	Fecal Strep. Per 100 ml.
9	22	10 45A	10	9.32	1.72	27.0	17.0	8.1	0	289	20.8	277	191	88	813	15	30			1,700
9	23	08 30A	11	8.85	1.47	30.0	10.0	8.1	0	280	19.7	282	201	81	781	12	35	33,000	3,300	1,600
9	24	10 10A	09	8.46	1.08	76.0	8.0	8.1	0	281	19.0	286	203	83	822	9	40	14,000	4,600	1,090
9	25	12 30P	14	9.49	3.33	30.0	8.0	8.1	0	275	20.4	288	200	88	855	9	30	13,000	1,300	190
9	26	01 50P	15	9.18	1.47	60.0	13.0	8.2	0	266	19.4	284	207	77	832	14	40	13,000	700	220
9	27	01 30P	15	9.28	3.26	70.0	9.0	8.3	0	252	18.5	290	176	114	788	9	50	31,000	24,000	520
9	28	10 20A	13	9.04	1.71	50.0	6.0	8.2	0	250	18.0	283	162	121	812	8	45	17,200	4,600	310
AV			12	9.08	2.01	49.	10.	8.1	0	270	19.5	284	191	97	813	10	38	20,200	6,400	800
11	07	10 00A	6	7.80	39.7	64.	26.	8.0	0			310			730	12	60	148,000	5,000	197,000
11	08	08 25A	4	7.75	20.7	82.	31.	8.1	0			302			820	14	50	330,000	5,000	240,000
11	09	09 30A	6	7.38	20.	162.	30.	8.0	0	216		302			787	13	50	221,000	5,000	137,000
11	10	07 15A	6	6.73	21.4	226.	22.	8.0	0	217		304			848	13	60	130,000	8,000	170,000
11	11	09 05A	7	6.94	22.	115.	33.	8.0	0	216		302			781	13	60	490,000	2,000	250,000
11	12	07 35A	6	6.80	23.2	230.	36.	8.0	0	215		305			787	14	85	240,000	130,000	530,000
11	13	09 35A	6	7.72	30.6	92.	34.	8.0	0	210		298			848	13	50	130,000	8,000	210,000
11	14	07 30A	4	7.66	19.6	110.	32.	8.0	0	210		300			769	9	65	79,000	2,000	40,000
11	15	09 40A	4	7.53	24.2	142.	28.	8.0	0	218		309			826	14	70	79,000	2,000	350,000
11	16	01 10P	4	8.38	30.9	137.	32.	7.8	0	216		296			752	12	70	172,000	2,000	300,000
11	17	03 40P	4	8.03	28.	162.	42.	7.8	0	220		299			775	13	95	109,000	23,000	490,000
11	18	07 05A	4	7.77	26.4	209.	42.	7.9	0	218		302			819	12	80	490,000	4,000	840,000
11	19	05 15A	3	7.56	22.8	135.	56.	7.8	0	218		300			819	12	85	79,000	2,000	460,000
11	20	03 00A	3	7.43	29.1	197.	65.	8.0	0	216		304			793	12	85	109,000	*2,000	360,000
AV			4	7.5	25.6	147.3	36.3	7.9	0	215		302			797	13	69	200,428	15,230	301,000

* Indicates less than

NORTH PLATTE RIVER SURVEY
WYOMING - NEBRASKA
SEPTEMBER & NOVEMBER 1961
RESULTS OF ANALYSES
STATION 7 (NP177.3)

Month	Date	Sample Time	Temp. °C	D.O. mg/l	B.O.D. mg/l	Susp. Solids mg/l	Volatile Susp. Solids mg/l	pH	Alkal. Phenol mg/l (as CaCO3)	Alkal. Total mg/l (as CaCO3)	Cl⁻ mg/l	Hard. mg/l	Ca. mg/l	Mg. mg/l	Specf. Conduct. µmhos/cm.	True Color Units	Turb. Units	Coli. M.P.N. Per 100 ml.	Fecal Coli M.P.N. Per 100 ml.	Fecal Strep Per 100 ml.
9	22	12 05P	10	9.68	1.65	19.0	2.0	8.1	0	280	21.4	298	206	92	800	15	*25			1,900
9	23	07 30A	10	8.97	1.67	52.0	21.0	8.1	0	281	21.0	298	198	100	812	13	45	24,000	2,300	3,600
9	24	11 00A	10	9.06	1.60	116.	15.0	8.0	0	270	20.6	298	202	96	832	10	75	4,900	1,300	800
9	25	01 00P	14	9.41	3.48	34.0	5.0	8.2	0	273	21.8	297	204	93	847	10	30	6,300	1,100	170
9	26	02 15P	15	9.12	2.78	43.0	12.0	8.2	0	274	21.7	294	210	84	855	14	35	3,300	*200	90
9	27	01 55P	15	9.33	2.31	53.0	11.0	8.3	0	251	18.4	289	153	136	781	10	50	23,000	800	400
9	28	10 40A	13	9.34	2.06	51.0	2.0	8.3	0	250	18.1	286	192	94	812	12	50	2,300	1,300	220
AV			12	9.27	2.22	53.	9.	8.1	0	268	18.	294	195	99	819	12	*44	10,600	1,300	1,000
11	07	10 25A	6	7.86	21.0	88.	25.	8.0	0			316			740	12	55	172,000	11,000	288,000
11	08	07 36A	4	7.23	15.6	88.	34.	8.0	0			306			827	12	50	221,000	4,000	160,000
11	09	10 00A	6	7.27	22.4	115.	19.	8.0	0	218		309			787	13	55	120,000	2,000	126,000
11	10	06 45A	5	6.46	18.8	242.	40.	8.0	0	220		311			848	14	70	172,000	5,000	110,000
11	11	09 40A	7	7.06	15.	124.	29.	8.0	0	216		306			794	11	60	330,000	5,000	122,000
11	12	07 00A	6	6.90	14.5	115.	32.	8.0	0	215		304			775	12	55	109,000	5,000	350,000
11	13	10 10A	6	7.49	27.	130.	43.	7.9	0	215		304			848	12	50	172,000	2,000	160,000
11	14	06 55A	4	7.39	14.4	115.	28.	8.0	0	214		304			769	13	75	79,000	7,000	400,000
11	15	10 15A	4	7.77	15.4	110.	27.	8.0	0	216		304			775	9	55	278,000	8,000	240,000
11	16	12 30P	4	8.01	30.8	194.	42.	7.8	0	219		299			752	12	95	34,000	2,000	470,000
11	17	04 15P	4	7.94	19.6	185.	45.	7.9	0	220		304			775	13	95	141,000	13,000	340,000
11	18	06 30A	3	7.82	18.2	209.	48.	7.9	0	216		304			812	13	80	172,000	2,000	430,000
11	19	05 45A	3	7.55	21.8	210.	43.	7.9	0	220		305			832	13	110	79,000	8,000	370,000
11	20	02 35A	3	6.98	22.6	282.	58.	8.0	0	216		306			793	14	85	221,000	2,000	350,000
AV			4	7.4	19.79	157.6	36.6	7.9	0	217		305			795	12	70	186,143	5,429	279,714

* Indicates less than

NORTH PLATTE RIVER SURVEY
WYOMING - NEBRASKA
SEPTEMBER & NOVEMBER 1961
RESULTS OF ANALYSES
STATION 8 (NP173.8)

Month	Date	Sample Time	Temp. °C	D.O. mg/l	B.O.D. mg/l	Susp. Solids mg/l	Volatile Susp. Solids mg/l	pH	Alkal. Phenol mg/l (as $CaCO_3$)	Alkal. Total mg/l (as $CaCO_3$)	Cl^- mg/l	Hard. mg/l	Ca. mg/l	Mg. mg/l	Spec. Conduct. µmhos/cm.	True Color Units	Turb. Units	Coli. M.P.N. Per 100 ml.	Fecal Coli M.P.N. Per 100 ml.	Fecal Strep. Per 100 ml.
9	22	12 35P	10	9.64	1.71	44.0	3.0	8.1	0	282	21.9	300	204	96	820	14	30			1.800
9	23	07 10A	10	9.09	1.75	63.0	16.0	8.1	0	283	20.9	295	160	135	800	13	55	21.000	3.300	3.500
9	24	11 50A	10	9.29	2.72	246.	32.0	8.2	0	266	20.0	297	155	142	827	13	170	34.800	4.900	2.600
9	25	08 40A	09	9.64	2.05	64.0	11.0	8.2	0	259	20.4	298	204	94	813	9	60	13.000	3.300	780
9	26	10 40A	12	9.50	2.13	39.0	10.0	8.2	0	266	20.0	296	199	97	832	12	40	14.100	1.700	210
9	27	10 30A	12	9.57	2.90	53.0	15.0	8.3	0	263	19.4	290	200	90	827	10	50	7.000	800	360
9	28	07 30A	10	8.98	1.81	73.0	3.0	8.3	0	253	18.6	291	184	107	813	13	75	22.100	3.300	560
AV			10	9.35	2.15	83.	12.	8.2	0	269	20.1	295	186	123	818	12	68	19.000	2.900	1.400
11	07	11 00A	6	7.48	19.0	90.	32.	7.9	0			313			770	12	50	172.000	23.000	135.000
11	08	07 10A	4	7.14	13.2	94.	32.	8.0	0			310			827	13	60	221.000	13.000	163.000
11	09	10 20A	6	7.14	15.6	230.	22.	8.0	0	221		309			787	12	65	130.000	*2.000	69.000
11	10	06 30A	5	6.34	10.4	203.	17.	8.0	0	220		308			848	12	55	130.000	8.000	160.000
11	11	10 00A	8	6.66	12.7	111.	30.	8.0	0	219		308			806	13	50	109.000	2.000	170.000
11	12	06 40A	6	6.50	12.9	119.	43.	8.0	0	220		308			794	12	50	130.000	*2.000	270.000
11	13	10 40A	6	7.51	21.9	92.	9.	8.0	0	217		308			848	12	40	130.000	4.000	380.000
11	14	06 30A	4	7.13	11.8	111.	23.	8.0	0	217		306			769	12	60	109.000	*2.000	340.000
11	15	10 40A	4	7.40	13.8	98.	27.	8.0	0	220		308			787	13	55	79.000	6.000	260.000
11	16	12 15P	4	7.92	21.5	122.	31.	7.9	0	221		308			826	13	85	49.000	*2.000	330.000
11	17	04 35P	4	7.56	16.7	168.	42.	7.9	0	221		305			775	14	90	130.000	*2.000	370.000
11	18	05 45A	3	7.40	15.8	165.	36.	7.9	0	218		306			812	12	70	141.000	5.000	520.000
11	19	06 00A	3	7.29	15.	179.	51.	7.9	0	218		305			825	12	110	330.000	5.000	370.000
11	20	02 20A	2	7.37	14.6	161.	47.	8.0	0	218		308			807	13	85	130.000	5.000	360.000
AV			4	7.2	15.35	138.7	31.5	7.9	0	217		307			806	12	66	142.142	8.111	278.357

* Indicates less than

NORTH PLATTE RIVER SURVEY
WYOMING - NEBRASKA
SEPTEMBER & NOVEMBER 1961
RESULTS OF ANALYSES
STATION 9 (NP166)

Month	Date	Sample Time	Temp °C	D.O mg/l	B.O D mg/l	Susp. Solids mg/l	Volatile Susp Solids mg/l	pH	Alkal. Phenol mg/l (as CaCo3)	Alkal Total mg/l (as CaCo3)	Cl⁻ mg/l	Hard mg/l	Ca. mg/l	Mg mg/l	Specf. Conduct µmhos/cm	True Color Units	Turb. Units	Coli. M.P.N Per 100 ml.	Fecal Coli MPN Per 100 ml	Fecal Strep Per 100 ml.
9	21	10 05A	15	8.46	4.88	74.0	23.0	8.1	0	292	26.0	291	203	88	870	12	40			500
9	22	07 10A	11	7.47	3.87	136.	9.0	8.0	0	278	23.7	288	188	100	789	14	90	490,000	109,000	18,000
9	23	11 40A	14	8.10	4.76	237.	33.0	8.1	0	288	22.9	297	108	189	813	14	120	79,000	17,000	1,700
9	24	07 15A	11	8.02	4.50	195.	25.0	8.1	0	282	21.4	295	128	167	840	11	120	34,800	22,000	5,100
9	25	07 10A	09	8.66	3.89	1165.	57.0	8.2	0	266	22.2	314	182	132	813	11	180	79,000	33,000	3,300
9	26	03 15P	16	7.70	**7.35	458.	36.0	8.2	0	272	22.1	300	219	81	847	14	100	33,000	17,000	7,700
9	27	02 40P	16	7.97	4.87	338.	24.0	8.2	0	269	21.2	294	188	106	827	13	90	70,000	33,000	2,600
AV			13	8.07	**4.87	371.9	29.	8.1	0	278	22.6	297	175	127	828	12	105	183,000	36,500	5,600
11	07	11 35A	8	5.04	35.	211.	33.	8.0	0			324			780	13	95	110,000	40,000	710,000
11	08	06 00A	5	4.39	25.	302.	43.	8.0	0			320			847	12	110	490,000	46,000	1,100,000
11	09	11 00A	6	4.79	29.8	407.	41.	7.9	0	242		318			827	14	95	1,300,000	70,000	1,200,000
11	10	08 05A	6	3.76	27.4	409.	73.	7.9	0	239		320			885	14	95	700,000	34,000	4,900,000
11	11	07 25A	6	3.11	33.8	406.	59.	7.9	0	240		318			806	16	130	700,000	49,000	890,000
11	12	08 00A	7	4.08	38.3	449.	68.	7.9	0	240		322			832	16	110	330,000	*20,000	2,000,000
11	13	12 05P	8	4.61	34.2	333.	60.	7.9	0	234		320			869	14	100	170,000	*20,000	690,000
11	14	07 20A	4	4.21	27.6	421.	67.	8.0	0	236		316			781	13	150	330,000	8,000	1,300,000
11	15	11 20A	5	5.00	28.	385.	49.	7.9	0	240		316			820	16	130	490,000	13,000	1,050,000
11	16	03 45P	4	4.70	45.5	357.	58.	7.8	0	237		315			813	22	140	460,000	109,000	1,200,000
11	17	12 00A	4	4.50	35.9	367.	64.	7.8	0	243		316			805	16	140	1,300,000	5,000	610,000
11	18	07 45A	3	4.98	35.4	502.	68.	7.9	0	240		320			832	13	150	240,000	32,000	2,100,000
11	19	07 00A	4	4.89	37.	548.	108.	7.8	0	234		312			832	16	140	330,000	13,000	2,000,000
11	20	01 35A	4	4.20	41.6	581.	103.	7.9	0	238		321			825	14	140	1,300,000	49,000	3,000,000
AV			5	4.45	33.9	405.5	63.8	7.9	0	238		318			825	15	123	589,256	39,000	1,625,000

* Indicates less than

** Indicates more than

NORTH PLATTE RIVER SURVEY
WYOMING - NEBRASKA
SEPTEMBER & NOVEMBER 1961
RESULTS OF ANALYSES

STATION 10 (NP160.2)

Month	Date	Sample Time	Temp. °C	D.O. mg/l	B.O.D. mg/l	Susp. Solids mg/l	Volatile Susp. Solids mg/l	pH	Alkal. Phenol mg/l (as CaCO3)	Alkal. Total mg/l (as CaCO3)	Cl⁻ mg/l	Hard. mg/l	Ca. mg/l	Mg. mg/l	Specf. Conduct μmhos/cm.	True Color Units	Turb. Units	Coli. M.P.N. Per 100 ml.	Fecal Coli M.P.N. Per 100 ml.	Fecal Strep. Per 100 ml.
9	21	10 25A	15	7.54	5.19	75.0	19.0	8.0	0	294	26.8	310	213	97	870	13	45	1.090.000	70.000	810
9	22	07 45A	11	7.54	4.68	130.	15.0	8.0	0	272	25.4	282	196	86	775	12	90	90.000	40.000	22.000
9	23	11 15A	14	8.10	4.21	184.	33.0	8.1	0	288	24.5	298	207	91	827	14	75	230.000	50.000	4.200
9	24	07 40A	11	8.09	5.50	276.	16.0	8.1	0	287	22.3	298	207	91	870	11	120	240.000	33.000	7.000
9	25	07 30A	09	8.69	4.74	1293.	64.0	8.2	0	279	19.8	310	211	99	840	11	210	33.000	17.000	5.500
9	26	03 00P	16	7.90	5.87	789.	49.0	8.2	0	276	22.3	305	206	99	855	15	150	109.000	11.000	500
9	27	02 20P	16	8.28	3.00	510.	54.0	8.2	0	274	21.5	298	205	93	840	9	120			600
AV			13	8.02	4.74	465.	35.	8.1	0	281	23.2	300	207	93	841	12	115	299.000	37.000	5.800
11	07	11 50A	7	5.78	28.5	228.	48.	8.0	0			332			800	14	75	230.000	*20.000	750.000
11	08	06 25A	4	5.17	20.8	354.	54.	7.9	0			320			862	12	90	490.000	49.000	390.000
11	09	10 35A	7	5.10	19.6	366.	58.	7.9	0	246		322			832	13	95	240.000	23.000	1.040.000
11	10	08 35A	6	2.38	24.6	432.	77.	7.9	0	248		319			885	13	110	790.000	94.000	2.000.000
11	11	07 50A	6	2.37	32.4	490.	74.	7.9	0	245		324			813	14	170	700.000	11.000	1.680.000
11	12	08 25A	6	3.33	30.1	390.	62.	7.9	0	246		322			794	13	120	790.000	13.000	1.200.000
11	13	11 45A	7	4.51	26.2	360.	52.	7.9	0	240		320			892	18	120	330.000	2.000	510.000
11	14	07 45A	4	3.69	26.9	446.	66.	8.0	0	242		318			806	16	140	460.000	21.000	1.800.000
11	15	11 00A	4	4.50	24.8	398.	49.	7.9	0	242		320			826	17	140	172.000	23.000	700.000
11	16	03 20P	4	5.13	31.6	365.	61.	7.8	0	251		316			800	14	140	490.000	5.000	730.000
11	17	12 20P	4	4.71	31.9	425.	70.	7.8	0	247		318			813	17	160	790.000	14.000	750.000
11	18	08 15A	4	4.54	36.8	492.	86.	7.9	0	246		319			812	13	140	9.200.000	23.000	1.400.000
11	19	06 40A	3	4.42	29.9	522.	99.	7.8	0	241		319			870	17	150	490.000	49.000	2.000.000
11	20	01 55A	4	4.09	27.8	533.	96.	7.9	0	240		322			819	13	160	490.000	33.000	1.500.000
AV			4	4.27	27.99	414.3	68.	7.9	0	244		320			830	14	129	1.118.713	27.692	1.169.285

* Indicates less than

NORTH PLATTE RIVER SURVEY
WYOMING - NEBRASKA
SEPTEMBER & NOVEMBER 1961
RESULTS OF ANALYSES
STATION 11 (NP154.6)

Month	Date	Sample Time	Temp. °C	D.O. mg/l	B.O.D. mg/l	Susp. Solids mg/l	Volatile Susp. Solids mg/l	pH	Alkal. Phenol mg/l (as $CaCO_3$)	Alkal. Total mg/l (as $CaCO_3$)	Cl^- mg/l	Hard. mg/l	Ca. mg/l	Mg. mg/l	Spec. Conduct µmhos/cm.	True Color Units	Turb. Units	Coli. M.P.N. Per 100 ml.	Fecal Coli M.P.N. Per 100 ml	Fecal Strep Per 100 ml.
9	21	10 45A	16	8.79	4.65	120.	32.0	8.1	0	284	27.0	314	211	103	870	12	55			830
9	22	08 05A	11	8.12	5.02	125.	16.0	8.0	0	270	26.8	298	200	98	800	13	90	330,000	33,000	22,000
9	23	10 55A	13	8.50	3.35	337.	41.0	8.2	0	265	22.0	306	206	100	770	14	130	172,000	109,000	7,000
9	24	11 00A	10	8.89	4.72	467.	44.0	8.1	0	255	19.9	298	200	98	775	12	130	70,000	49,000	4,100
9	25	08 00A	10	9.21	5.14	707.	60.0	8.2	0	282	22.4	310	184	126	855	10	200	172,000	70,000	2,700
9	26	02 45P	16	8.14	6.66	499.	48.0	8.1	0	271	22.7	308	178	130	855	16	150	63,000	23,000	800
9	27	01 50P	16	8.30	2.90	357.	22.0	8.3	0	263	20.5	302	178	124	827	8	100	172,000	17,000	1,200
AV			13	8.56	4.63	373.	37.	8.1	0	270	23.0	305	193	111	821	12	122	163,000	50,000	5,500
11	07	12 05P	6	5.62	17.0	188.	37.	8.0	0			332			814	12	70	230,000	*20,000	300,000
11	08	06 45A	4	5.48	16.4	347.	66.	7.9	0			319			832	13	80	790,000	33,000	490,000
11	09	10 10A	6	5.25	19.2	405.	59.	7.9	0	242		326			827	13	100	790,000	49,000	280,000
11	10	08 55A	6	4.62	19.	387.	44.	7.9	0	238		324			867	13	95	221,000	109,000	780,000
11	11	11 15A	8	4.55	24.1	492.	76.	7.9	0	245		322			826	14	150	221,000	170,000	640,000
11	12	08 45A	6	5.19	22.	414.	52.	7.9	0	246		322			800	9	100	278,000	13,000	800,000
11	13	10 15A	6	5.33	20.8	351.	53.	7.9	0	242		320			900	12	120	278,000	17,000	340,000
11	14	08 05A	4	5.69	20.8	317.	55.	8.0	0	237		318			806	13	110	330,000	49,000	620,000
11	15	10 40A	4	8.04	19.4	357.	54.	7.9	0	242		319			822	14	130	490,000	13,000	530,000
11	16	01 55P	4	6.01	24.8	323.	49.	7.8	0	246		319			813	12	120	172,000	33,000	470,000
11	17	12 45P	4	5.42	28.2	414.	81.	7.9	0	253		320			805	17	170	330,000	23,000	860,000
11	18	08 40A	2	6.38	26.3	417.	80.	7.9	0	242		320			825	13	150	490,000	79,000	790,000
11	19	04 55A	3	5.06	24.2	493.	84.	7.8	0	243		320			854	14	150	240,000	13,000	810,000
11	20	05 00A	2	6.06	23.6	672.	117.	7.9	0	250		321			832	14	160	330,000	23,000	390,000
AV			4	5.69	21.84	398.3	64.7	7.9	0	243		321			830	13	121	370,714	460,000	578,571

* Indicates less than

NORTH PLATTE RIVER SURVEY
WYOMING - NEBRASKA
SEPTEMBER & NOVEMBER 1961
RESULTS OF ANALYSES

STATION 12 (NP149.8)

Month	Date	Sample Time	Temp. °C	D.O. mg/l	B.O.D. mg/l	Susp. Solids mg/l	Volatile Susp. Solids mg/l	pH	Alkal. Phenol mg/l (as CaCO3)	Alkal. Total mg/l (as CaCO3)	Cl⁻ mg/l	Hard. mg/l	Ca. mg/l	Mg. mg/l	Spect. Conduct µmhos/cm.	True Color Units	Turb. Units	Coli. M.P.N. Per 100 ml.	Fecal Coli M.P.N. Per 100 ml.	Fecal Strep Per 100 ml.
9	21	11 40A	17	8.41	4.78	121.	19.0	8.1	0	262	26.0	315	201	114	870	11	60			350
9	22	08 30A	11	8.47	3.35	174.	28.0	8.1	0	256	24.5	294	184	110	770	14	110	46,000	5,000	6,100
9	23	07 15A	10	9.20	3.05	278.	39.0	8.2	0	271	24.8	306	76	230	910	21	120	109,000	22,000	4,900
9	24	08 15A	11	8.83	3.80	189.	25.0	8.2	0	289	26.8	310	216	94	910	15	140	33,000	8,000	1,200
9	25	08 30A	09	9.69	4.30	266.	22.0	8.3	0	287	25.5	310	108	202	800	14	140	33,000	8,000	3,400
9	26	12 15P	14	8.47	**7.50	824.	58.0	8.2	0	287	25.7	314	178	136	925	21	200	70,000	13,000	1,000
9	27	11 00A	14	8.40	3.88	181.	25.0	8.3	0	281	26.9	310	206	104	910	13	120	79,000	3,300	1,600
AV			12	8.78	**4.38	290.	30.0	8.2	0	276	25.9	308	167	142	870	15	129	62,000	14,800	2,700
11	07	01 35P	7	6.68	22.	253.	49.	7.9	0			337			812	12	90	175,000	23,000	120,000
11	08	08 40A	4	7.46	15.	336.	79.	7.9	0			325			862	13	90	490,000	33,000	260,000
11	09	08 20A	5	7.02	13.9	333.	46.	7.9	0	242		325			840	14	90	221,000	79,000	410,000
11	10	10 45A	7	6.50	18.4	357.	50.	8.0	0	240		324			901	14	100	221,000	13,000	280,000
11	11	09 45A	7	5.89	19.4	364.	50.	7.9	0	242		326			832	14	120	172,000	33,000	270,000
11	12	10 20A	6	6.98	15.	350.	47.	8.0	0	238		323			812	14	120	278,000	17,000	750,000
11	13	09 50A	5	7.00	16.	47.	21.	7.9	0	242		324			910	11	110	130,000	8,000	320,000
11	14	09 35A	4	6.99	16.8	400.	66.	8.0	0	240		320			813	12	120	490,000	17,000	550,000
11	15	09 05A	4	7.39	15.8	357.	60.	7.9	0	240		323			832	13	130	221,000	13,000	320,000
11	16	01 30P	4	8.14	18.4	291.	55.	7.9	0	236		320			813	13	130	330,000	17,000	250,000
11	17	02 15P	4	6.90	22.	433.	69.	7.9	0	248		322			805	14	160	330,000	23,000	300,000
11	18	10 25A	2	7.55	26.8	458.	76.	7.9	0	240		322			825	13	150	1,300,000	13,000	480,000
11	19	04 35A	2	7.23	18.3	357.	78.	7.9	0	238		320			848	12	140	330,000	17,000	660,000
11	20	04 30A	2	7.27	24.3	1085.	153.	8.0	0	248		323			840	13	210	1,090,000	17,000	690,000
AV			4	7.07	19.44	387.2	64.2	7.9	0	241		323			839	13	125	412,714	23,071	405,714

** Indicates more than

NORTH PLATTE RIVER SURVEY
WYOMING – NEBRASKA
SEPTEMBER & NOVEMBER 1961
RESULTS OF ANALYSES
STATION 13 (NW149.3-0.5)

Month	Date	Sample Time	Temp °C	D.O. mg/l	B.O.D. mg/l	Susp. Solids mg/l	Volatile Susp. Solids mg/l	pH	Alkal. Phenol mg/l (as CaCO3)	Alkal. Total mg/l (as CaCO3)	Cl⁻ mg/l	Hard mg/l	Ca. mg/l	Mg. mg/l	Spect. Conduct. μmhos/cm.	True Color Units	Turb. Units	Coli. M.P.N. Per 100 ml.	Fecal Coli M.P.N. Per 100 ml.	Fecal Strep. Per 100 ml.
9	21	04 15P	14	7.91																4,300
9	22	10 30A	11	9.19														46,000	21,000	3,300
9	23	10 15A	11	8.77														70,000	14,000	20,000
9	24	10 25A	10	8.91														33,000	13,000	4,300
9	25	10 30A	13	9.23														34,800	10,900	1,100
9	26	02 20P	17	8.41														34,800	13,000	2,300
9	27	01 20P	13	8.74														14,100	3,100	500
AV			12	8.75					0									38,800	12,500	6,100
11	07	01 00P	10	10.60	2.88	43.	10.	8.1	0			321			740	7	*25	7,900	1,700	600
11	08	07 55A	5	9.90	0.74	18.4	6.	8.0	0			316			770	7	*25	7,900	2,400	2,500
11	09	09 10A	6	10.10	1.19	14.4	4.	8.1	0	192		318			757	8	*25	4,900	3,300	440
11	10	09 55A	8	10.26	1.32	14.8	5.6	8.1	0	192		318			775	7	*25	7,000	410	530
11	11	10 25A	8	10.21	1.12	22.8	9.6	8.1	0	193		317			735	7	*25	13,000	500	600
11	12	09 35A	8	9.92	1.11	16.4	6.	8.1	0	193		317			752	13	*25	4,300	1,300	1,100
11	13	11 10A	8	10.97	0.98	12.	6.4	8.0	0	192		316			806	7	*25	10,900	200	160,000
11	14	08 55A	4	10.27	0.97	32.4	6.4	8.1	0	191		316			725	7	*25	3,300	2,300	900
11	15	09 50A	6	10.18	1.08	17.	8.	8.0	0	192		315			719	7	*25	17,200	4,900	960
11	16	02 40P	6	11.56	3.49	132.	13.5	8.1	0	190		311			709	6	*25	10,900	7,000	730
11	17	01 35P	6	11.27	1.27	19.	17.	8.0	0	192		316			714	6	*25	33,000	10,900	660
11	18	09 40A	5	10.50	1.41	18.	3.3	8.1	0	191		314			724	6	*25	13,000	1,300	650
11	19	05 30A	4	9.40	2.05	142.	22.5	8.0	0	192		316			781	8	*25	79,000	49,000	6,000
11	20	02 45A	4	9.62	1.52	28.5	16.	8.0	0	176		309			704	7	*25	7,900	2,300	930
AV			6	10.34	1.51	37.9	10.9	8.0	0	190		315			744	7	*25	15,729	6,251	12,614

* Indicates less than

NORTH PLATTE RIVER SURVEY
WYOMING - NEBRASKA
SEPTEMBER & NOVEMBER 1961
RESULTS OF ANALYSES
STATION 1A (NP141.8)

Month	Date	Sample Time	Temp °C	D.O. mg/l	B.O.D. mg/l	Susp. Solids mg/l	Volatile Susp. Solids mg/l	pH	Alkal. Phenol mg/l as CaCO3	Alkal. Total mg/l as CaCO3	Cl⁻ mg/l	Hard. mg/l	Ca. mg/l	Mg. mg/l	Specf. Conduct µmhos/cm.	True Color Units	Turb. Units	Coli. M.P.N. Per 100 ml.	Fecal Coli M.P.N. Per 100 ml.	Fecal Strep Per 100 ml.
9	21	12 20P	16	8.60	4.50	140.	22.4	8.1	0	278	24.5	318	112	106	832	9	85			360
9	22	09 15A	11	8.90	3.07	122.	5.0	8.2	0	262	23.5	306	171	135	763	13	120	49,000	3,300	4,600
9	23	07 45A	10	9.03	3.15	226.	39.0	8.2	0	269	23.1	302	88	214	776	15	150	21,000	13,000	3,300
9	24	08 45A	10	8.85	3.82	162.	25.0	8.1	0	267	23.3	306	72	234	848	14	140	33,000	23,000	5,700
9	25	08 50A	10	9.56	2.87	792.	42.0	8.3	0	266	21.4	310	196	114	819	10	160	46,000	*2,000	1,800
9	26	12 50P	16	9.00	3.44	1036.	68.0	8.3	0	264	22.3	310	146	164	855	14	210	49,000	7,000	1,100
9	27	11 40A	14	9.09	3.07	234.	25.0	8.3	0	268	21.7	312	167	145	848	14	120	34,800	4,900	2,100
AV			12	9.00	3.42	387.	32.3	8.1	0	268	22.8	309	136	158	819	12	126	38,800	8,900	3,000
11	07	02 05P	7	8.34	17.	265.	42.	8.0	0			338			820	13	80	240,000	49,000	110,000
11	08	09 15A	4	8.73	16.	349.	54.	8.0	0			322			848	12	100	1,300,000	13,000	220,000
11	09	07 45A	4	8.05	17.	396.	39.	8.0	0	240		320			827	13	95	221,000	13,000	130,000
11	10	11 20A	7	8.10	14.4	391.	62.	8.0	0	236		326			870	14	100	221,000	17,000	14,000
11	11	09 15A	6	7.60	15.7	410.	45.	8.0	0	237		321			800	13	90	79,000	23,000	230,000
11	12	10 50A	6	8.41	14.6	631.	161.	8.0	0	236		322			812	7	120	109,000	13,000	540,000
11	13	08 30A	4	8.88	14.4	401.	46.	8.0	0	235		315			876	13	110	79,000	5,000	570,000
11	14	10 05A	4	9.05	14.4	321.	54.	8.0	0	232		324			806	12	110	221,000	5,000	300,000
11	15	08 30A	3	8.87	15.8	450.	84.	8.0	0	239		317			814	13	130	221,000	49,000	150,000
11	16	12 55P	2	9.56	17.2	416.	53.	7.9	0	242		324			807	13	120	490,000	8,000	400,000
11	17	02 50P	3	8.90	19.2	481.	85.	7.9	0	246		320			884	14	140	172,000	8,000	390,000
11	18	11 05A	2	9.26	24.4	366.	57.	7.9	0	235		324			825	12	130	430,000	17,000	230,000
11	19	03 20A	2	9.28	17.2	457.	83.	7.9	0	236		320			840	12	130	330,000	2,000	220,000
11	20	03 20A	1	8.70	22.4	369.	108.	8.0	0	240		320			832	13	160	172,000	5,000	410,000
AV			3	8.62	17.1	405.9	69.5	7.9 *	0	237		322			833	12	115	306,071	16,214	280,143

* Indicates less than

NORTH PLATTE RIVER SURVEY
WYOMING - NEBRASKA
SEPTEMBER & NOVEMBER 1961
RESULTS OF ANALYSES
STATION 15 (KP127)

Month	Date	Sample Time	Temp °C	D.O. mg/l	B.O.D. mg/l	Susp. Solids mg/l	Volatile Susp. Solids mg/l	pH	Alkal. Phenol mg/l as CaCO3	Alkal. Total mg/l as CaCO3	Cl⁻ mg/l	Hard mg/l	Ca. mg/l	Mg. mg/l	Specf. Conduct µmhos/cm.	True Color Units	Turb. Units	Coli. M.P.N. Per 100 ml.	Fecal Coli M.P.N. Per 100 ml	Fecal Strep Per 100 ml.
9	21	12 50P	17	8.61	4.19	165.	28.0	8.2	0	272	23.7	304	194	110	770	10	100			420
9	22	09 45A	11	9.12	4.10	272.	36.0	8.2	0	254	20.9	283	193	90	709	12	150			
9	23	08 30A	10	9.19	3.20	186.	30.0	8.2	0	257	22.2	286	188	98	750	15	160	33,000	23,000	3,700
9	24	09 15A	10	9.25	3.61	256.	10.0	8.2	0	270	22.1	302	116	186	800	14	180	34,800	7,900	3,300
9	25	09 35A	10	9.92	2.79	413.	7.0	8.3	0	271	21.2	306	216	90	794	14	160	21,000	4,900	1,900
9	26	01 20P	16	9.35	4.13	283.	37.0	8.3	0	266	21.0	305	132	173	840	14	180	17,200	4,900	600
9	27	12 00P	15	9.13	3.19	256.	27.0	8.4	2.2	261	20.4	302	130	172	820	14	150	54,200	7,000	500
AV			12	9.22	3.6	262.	25.	8.2	0	264	2.2	298	167	131	783	13	154	32,000	1,700	9,500
11	07	02 30P	6	10.33	11.5	196.	31.	8.1	0			324			794	13	75	34,000	5,000	57,000
11	08	09 55A	4	10.45	9.50	298.	29.	8.0	0			314			827	9	85	130,000	7,900	48,000
11	09	07 10A	4	9.81	11.6	291.	40.	8.1	0	234		312			793	8	75	172,000	10,900	43,000
11	10	11 45A	7	9.90	10.	350.	51.	8.1	0	230		318			855	12	95	109,000	3,300	22,000
11	11	08 35A	5	9.43	10.8	336.	45.	8.1	0	232		318			769	12	80	79,000	4,000	51,000
11	12	11 15A	6	9.87	10.8	275.	43.	8.1	0	232		310			775	12	110	79,000	2,000	59,000
11	13	09 00A	3	10.60	9.29	279.	45.	8.1	0	231		313			840	12	85	109,000	2,000	28,000
11	14	10 35A	3	11.00	8.60	342.	48.	8.1	0	230		312			707	9	100	49,000	2,000	69,000
11	15	07 55A	2	10.55	10.1	323.	49.	8.1	0	231		309			769	12	110	70,000	5,000	75,000
11	16	12 25P	2	11.38	11.1	285.	51.	8.0	0	232		311			752	8	120	490,000	8,000	87,000
11	17	03 15P	2	10.90	11.2	300.	56.	8.1	0	227		310			764	9	120	172,000	2,000	63,000
11	18	11 40A	2	11.21	17.2	375.	53.	8.0	0	226		308			762	9	120	79,000	2,000	107,000
11	19	03 00A	1	10.99	11.6	275.	50.	8.0	0	229		308			800	12	110	109,000	5,000	81,000
11	20	03 45A	1	10.45	12.6	332.	93.	8.1	0	230		311			793	11	130	330,000	7,000	101,000
AV			3	10.49	11.14	304.0	48.8	8.0	0	230		312			786	10	101	143,643	4,721	63,643

NORTH PLATTE RIVER SURVEY
WYOMING - NEBRASKA
SEPTEMBER & NOVEMBER 1961
RESULTS OF ANALYSES
STATION 16 (00273-1.5)

Month	Date	Sample Time	Temp °C	D.O. mg/l	B.O.D. mg/l	Susp. Solids mg/l	Volatile Susp. Solids mg/l	pH	Alkal. Phenol mg/l as CaCO3	Alkal. Total mg/l as CaCO3	Cl⁻ mg/l	Hard mg/l	Ca. mg/l	Mg. mg/l	Spect. Conduct µmhos/cm.	True Color Units	Turb. Units	Coli. M.P.N. Per 100 ml.	Fecal Coli M.P.N. Per 100 ml.	Fecal Strep. Per 100 ml.
9	22	03 00P	17	5.10	17.4	27.0	9.0	8.0	0	337	48.6	278	175	103	943	22	30	230,000	49,000	51,000
9	23	01 30P	16	6.12	5.17	25.0	22.0	7.9	0	393	37.4	350	240	110	990	19	*25	79,000	33,000	29,000
9	24	11 25A	13	6.10	17.4	39.0	27.0	8.1	0	382	38.1	339	233	106	1040	36	70	348,000	348,000	206,000
9	25	08 30A	13	7.66	1.82	4.0	4.0	8.1	0	371	41.4	338	229	109	1030	8	*25	348,000	348,000	6,200
AV			15	6.24	10.4	23.8	15.	8.	0	378	41.3	326	219	107	990	23	*23	251,000	194,500	73,000
11	07	11 10A	36																	
11	08	05 30A	38		201.	4225.	348.	7.7		266		312			762	44	800	1,720,000	230,000	12,000,000
11	09	11 25A	36		324.	2224.	236.	7.6		208		305			832	46	900	2,400,000	140,000	17,700,000
11	10	07 40A	35		197.	2636.	340.	7.6		209		314			825	50	1000	4,900,000	1,300,000	186,000,000
11	11	11 50A	35		392.	3348.	400.	7.5		212		307			757	55	1200	34,800,000	170,000	35,000,000
11	12	07 30A	34															14,000,000	80,000	91,000,000
11	13	12 25P	35															7,900,000	20,000	29,000,000
11	14	07 00A	33															7,900,000	130,000	43,000,000
11	15	11 50A	32															3,300,000	50,000	20,000,000
11	16	04 20P	36															7,900,000	110,000	18,500,000
11	17	04 25P	32															17,200,000	330,000	12,000,000
11	18	07 10A	36															13,000,000	80,000	17,000,000
11	19	07 30A	34															17,200,000	20,000	20,000,000
11	20	01 10A	32															17,200,000	20,000	19,000,000
																		13,000,000	20,000	42,000,000
AV			34		270.5	3108.2	331.	7.6	0	223		309			794	48	975	11,601,429	192,857	40,121,429

* Indicates less than

NORTH PLATTE RIVER SURVEY
WYOMING - NEBRASKA
SEPTEMBER & NOVEMBER 1961
RESULTS OF ANALYSES
STATION 19 (NP208.0)

Month	Date	Sample Time	Temp °C	D.O. mg/l	B.O.D. mg/l	Susp. Solids mg/l	Volatile Susp. Solids mg/l	pH	Alkal. Phenol mg/l as CaCO₃	Alkal. Total mg/l as CaCO₃	Cl⁻ mg/l	Hard mg/l	Ca. mg/l	Mg mg/l	Specif. Conduct µmhos/cm	True Color Units	Turb. Units	Coli. M.P.N. Per 100 ml.	Fecal Coli M.P.N. Per 100 ml	Fecal Strep Per 100 ml.
11	07	07 45A	42															7,900,000	170,000	90,000,000
11	08	10 57A	38															4,900,000	170,000	48,000,000
11	09	07 00A	41															7,900,000	50,000	102,000,000
11	10	10 25A	38															3,300,000	80,000	90,000,000
11	11	06 30A	38															4,900,000	*20,000	114,000,000
11	12	09 55A	46		1170.	1480.	320.	7.2		235		394			892	100	900	*20,000	*20,000	100,000
11	13	07 05A	34		1360.	441.	98.	9.6	48.2	268		453			980	190	900	10,900,000	20,000	19,000,000
11	14	10 15A	40		1030.	1820.	332.	6.9	0	226		476			901	100	1100	7,900,000	50,000	39,000,000
11	15	07 15A	36		1880.	1920.	552.	11.5	279.	559		710				360	1200	3,300,000	*20,000	171,000,000
11	16	03 40P	38															6,300,000	230,000	110,000,000
11	17	12 55P	38															3,300,000	20,000	93,000,000
11	18	09 25A	35															13,000,000	20,000	19,000,000
11	19	03 25A	34															4,900,000	*20,000	510,000,000
11	20	05 00A	35															13,000,000	80,000	340,000,000
AV			38		1360.	1417.2	325.5	8.8	81.6	322		508			924	187	1025	7,038,615	89,000	132,692,304

* Indicates less than

NORTH PLATTE RIVER SURVEY
WYOMING - NEBRASKA
SEPTEMBER & NOVEMBER 1961
RESULTS OF ANALYSES

STATION 8D (NPR-1.5)

Month	Date	Sample Time	Temp °C	D.O. mg/l	B.O.D. mg/l	Susp. Solids mg/l	Volatile Susp. Solids mg/l	pH	Alkal. Phenol mg/l as CaCO3	Alkal. Total mg/l as CaCO3	Cl⁻ mg/l	Hard mg/l	Ca. mg/l	Mg mg/l	Spec. Conduct. µmhos/cm	True Color Units	Turb. Units	Coli. M.P.N. Per 100 ml.	Fecal Coli M.P.N. Per 100 ml	Fecal Strep Per 100 ml.
11	07	09 10A	28															13,000,000	300,000	8,400,000
11	08	09 20A	24															17,200,000	490,000	6,300,000
11	09	08 30A	26															22,100,000	200,000	2,600,000
11	10	08 00A	31															10,900,000	*200,000	4,300,000
11	11	08 10A	24															7,900,000	200,000	6,100,000
11	12	08 35A	30		624.	4612.	752.	9.3	37.8	189		323			636	50	1600	13,000,000	200,000	1,400,000
11	13	08 45A	26		670.	5108.	872.	9.2	32.2	188		312			666	70	1800	342,000,000	7,900,000	16,200,000
11	14	08 30A	29		607.	5276.	824.	9.2	35.8	196		332			662	85	1800	7,000,000	*200,000	9,800,000
11	15	08 45A	29		764.	5636.	1056.	9.2	36.0	190		320				50	1800	2,200,000	*200,000	2,700,000
11	16	01 35P	24															10,700,000	*200,000	2,600,000
11	17	02 25P	26															13,000,000	*200,000	11,400,000
11	18	07 50A	24															24,000,000	*200,000	1,300,000
11	19	06 40A	28															4,600,000	*200,000	17,000,000
11	20	03 35A	27															13,000,000	*200,000	26,000,000
AV			26		666.25	5158.	876.	9.2	35.4	190		321			654	63	1750	30,037,143	1,348,333	8,261,429

* Indicates less than

NORTH PLATTE RIVER SURVEY
WYOMING - NEBRASKA
SEPTEMBER & NOVEMBER 1961
RESULTS OF ANALYSES
STATION 21 (08173.8-3.0)

Month	Date	Sample Time	Temp. °C	D.O. mg/l	B.O.D. mg/l	Susp. Solids mg/l	Volatile Susp. Solids mg/l	pH	Alkal. Phenol mg/l (as CaCO3)	Alkal. Total mg/l (as CaCO3)	Cl⁻ mg/l	Hard. mg/l	Ca. mg/l	Mg. mg/l	Spect. Conduct. µmhos/cm.	True Color Units	Turb. Units	Coli. M.P.N. Per 100 ml.	Fecal Coli M.P.N. Per 100 ml.	Fecal Strep Per 100 ml.
11	07	03 50P	38															7,900,000	490,000	6,200,000
11	08	11 00A	30		1320.	5790.	872.	11.6	2'2.	513		772			1785	90	2000	2,400,000	50,000	570,000
11	09	11 40A	38		1250.	5516.	720.	9.1	62.0	258		446			953	220	1700	3,300,000	200,000	8,800,000
11	10	07 20A	36		1310.	5656.	1400.	11.3	222.	539		731			1610	270	1900	2,400,000	230,000	4,500,000
11	11	12 00A	33		1700.	6568.	800.	10.0	73.8	358		589			1390	190	2000	4,900,000	110,000	6,100,000
11	12	07 10A	35															2,210,000	*20,000	14,000,000
11	13	12 40P	37															*20,000	*20,000	16,200,000
11	14	06 40A	35															*20,000	*20,000	9,800,000
11	15	12 05P	37															3,300,000	330,000	80,000,000
11	16	04 35P	34															2,400,000	20,000	24,000,000
11	17	04 35P	34															2,780,000	50,000	14,000,000
11	18	06 45A	32															790,000	20,000	86,000,000
11	19	07 40A	30															4,900,000	50,000	10,200,000
11	20	12 55A	34															2,400,000	200,000	3,000,000
AV			34		1395.	5882.5	948.	10.5	154.9	417		634			1435	192	1900	3,306,666	159,091	20,240,714

* Indicates less than

NORTH PLATTE RIVER SURVEY
WYOMING - NEBRASKA
SEPTEMBER & NOVEMBER 1961
RESULTS OF ANALYSES
STATION 22 (GB150-2.5)

Month	Date	Sample Time	Temp. °C	D.O. mg/l	B.O.D. mg/l	Susp. Solids mg/l	Volatile Susp. Solids mg/l	pH	Alkal. Phenol mg/l (as CaCO₃)	Alkal. Total mg/l (as CaCO₃)	Cl⁻ mg/l	Hard. mg/l	Ca. mg/l	Mg. mg/l	Spec. Conduct µmhos/cm.	True Color Units	Turb. Units	Coli. M.P.N. Per 100 ml.	Fecal Coli M.P.N. Per 100 ml.	Fecal Strep. Per 100 ml.
11	07	12 30P	32															230,000	*20,000	7,500,000
11	08	07 15A	31															16,000,000	63,000	11,000,000
11	09	09 45A	31															16,000,000	141,000	12,600,000
11	10	09 20A	32															3,300,000	70,000	67,000,000
11	11	11 00A	34															3,300,000	400,000	19,000,000
11	12	09 10A	30															790,000	80,000	13,000,000
11	13	10 40A	31															3,300,000	*20,000	9,800,000
11	14	08 25A	30															10,900,000	20,000	8,000,000
11	15	10 15A	29															7,900,000	20,000	18,000,000
11	16	02 15P	32		550.	4952.	792.	8.9	20.6	204		340			770	55	1200	4,900,000	*20,000	11,000,000
11	17	01 05P	32		576.	6392.	976.	9.0	23.4	210		355			769	55	2300	10,900,000	*20,000	11,200,000
11	18	09 05A	29		606.	5796.	944.	8.9	21.2	198		324			775	48	1700	24,000,000	20,000	20,000,000
11	19	06 10A	24		600.	7512.	880.	8.9	18.2	224		355			800	50	2300	4,600,000	20,000	6,300,000
11	20	02 10A	26															7,900,000	*20,000	9,600,000
AV			30		583.0	6163.	898.	8.9	20.8	209		340			779	52	1875	8,144,286	70,444	16,000,000

* Indicates less than

NORTH PLATTE RIVER SURVEY
WYOMING - NEBRASKA
SEPTEMBER & NOVEMBER 1961
RESULTS OF ANALYSES
[illegible] 23 (OB150-2.0)

Month	Date	Sample Time	Temp. °C	D.O. mg/l	B.O.D. mg/l	Susp. Solids mg/l	Volatile Susp. Solids mg/l	pH	Alkal. Phenol mg/l (as CaCO3)	Alkal. Total mg/l (as CaCO3)	Cl⁻ mg/l	Hard. mg/l	Ca. mg/l	Mg. mg/l	Specf. Conduct. µmhos/cm.	True Color Units	Turb. Units	Coli. M.P.N. Per 100 ml.	Fecal Coli M.P.N. Per 100 ml.	Fecal Strep. Per 100 ml.
11	07	12 20P	6															490,000	*20,000	490,000
11	08	07 05A	1															2,400,000	20,000	640,000
11	09	09 55A	4															2,210,000	20,000	360,000
11	10	09 10A	3															4,900,000	*20,000	1,800,000
11	11	10 55A	8															490,000	*20,000	530,000
11	12	09 00A	4															1,720,000	*20,000	1,200,000
11	13	10 30A	4															2,400,000	20,000	630,000
11	14	08 15A	1															2,210,000	20,000	1,500,000
11	15	10 25A	2															270,000	*20,000	870,000
11	16	02 05P	1		174.	56.	44.	7.6	0	388		480			1052	50	90	790,000	*20,000	2,300,000
11	17	12 55P	2		176.	77.	57.	7.7	0	340		442			953	65	100	3,300,000	*20,000	1,100,000
11	18	08 55A	1		231.	56.	23.	7.7	0	342		444			951	55	60	3,300,000	*20,000	1,800,000
11	19	06 20A	0		236.	384.	73.	7.8	0	372		490			1041	50	240	790,000	*20,000	2,300,000
11	20	02 20A	0															1,720,000	*20,000	4,700,000
AV			2		204.25	143.2	49.2	7.7	0	355		464			999	55	122	1,927,857	20,000	1,444,286

* Indicates less than

NORTH PLATTE RIVER SURVEY
WYOMING - NEBRASKA
SEPTEMBER & NOVEMBER 1961
RESULTS OF ANALYSES

STATION 24 (NO173-1.5)

Month	Date	Sample Time	Temp. °C	D.O. mg/l	B.O.D. mg/l	Susp. Solids mg/l	Volatile Susp. Solids mg/l	pH	Alkal. Phenol mg/l as $CaCO_3$	Alkal. Total mg/l as $CaCO_3$	Cl^- mg/l	Hard mg/l	Ca. mg/l	Mg. mg/l	Specf. Conduct µmhos/cm.	True Color Units	Turb. Units	Coli. M.P.N. Per 100 ml.	Fecal Coli M.P.N. Per 100 ml	Fecal Strep Per 100 ml.
11	15																	7,900,000	3,300,000	25,000,000
11	16	04 15P																4,900,000	1,090,000	2,300,000
11	17	04 15P																92,000,000	17,200,000	36,000,000
11	18	07 05A																4,900,000	4,900,000	1,500,000
11	19	07 25A																3,300,000	1,300,000	500,000
11	20	01 08A																4,900,000	3,300,000	98,000,000
																		19,650,000	5,181,667	27,216,667

APPENDIX B

DEOXYGENATION

DEOXYGENATION

DEOXYGENATION RATE

k_1 The rate coefficient of the demand for oxygen as the result of the biochemical oxidation of organic matter. Here the rate of the demand is important. The rate of deoxygenation is the rate at which the oxygen demands of the biochemical oxidation process are satisfied or exerted. The rate is proportional to the remaining concentration of unoxidized substance measured in terms of oxidizability.

k_1 Formulation

Using common logs - base 10:

(1) $$k_1 = \frac{\log La - \log L_t}{t}$$

La = BOD at upstream station.
Lt = BOD at time "t".
t = Time of travel in days.

(2) Also: log % BOD remaining = 2 - k_1 t.

Using the Torrington and Mitchell Stations:

k_1 = 0.42 per day.

The k_1 value of 0.42 is high. In many cases the k_1 value is assumed to be 0.1.

Assuming a time of 1 day, and a k_1 value of 0.42,

log % BOD remaining = 2-k_1 t.

log % BOD remaining = 2-0.42 x 1.

% BOD remaining = 38.

At a k_1 rate of 0.42, at the end of 1 day 62% of the BOD will be satisfied. At the end of the second day 14.5% of the original BOD will remain or 85.5% will be satisfied.

At a k_1 rate of 0.1, 79.5% of the original BOD will remain at the end of the first day.

At, and below, the Bayard station the deoxygenation rate or k_1 was found to be 0.26 per day.

APPENDIX C

BACTERIOLOGICAL EXAMINATION OF STREAM SAMPLES

BACTERIOLOGICAL EXAMINATION OF STREAM SAMPLES

INTRODUCTION TO METHODOLOGY

The standard tests for the coliform group described in Standard Methods for the Examination of Water and Wastewater, 11th edition, 1960 (1) are designed specifically for the quantitative determination of the coliform group. The coliform group includes all the aerobic and facultative anaerobic, non-spore-producing, gram-negative rods which ferment lactose with gas production within 48 hours at 35 (± 0.5)° C. The standard tests are:

1. Presumptive Test (based on gas production from lactose) in which a negative reaction excludes the coliform group and a positive test indicates that coliform bacteria may be present.
2. Confirmed Test which demonstrates gas production from lactose in the presence of bile salts and brilliant green.

The above Standard Methods procedures, by not distinguishing between the various types of coliform bacteria composing the coliform group, yield no information as to their possible source or origin. A group of tentative differential tests is described but no suggestions are given as to their interpretation other than such procedures seldom give sufficient information to justify the labor and time required for the procedures. Presence or absence of the coliform group is all that is necessary in the bacterial examination of a potable water and the standard tests are adequate for this purpose (2).

The objectives in the bacteriological investigation of untreated surface waters, such as used in a stream survey, must go beyond the procedures described in Standard Methods. Bacteriological objectives include the quantitative estimation of all indicator microorganisms of pollution so that as much information as to the probable sources and significance can be collected as is consistent with accepted bacteriological research methods and practices.

In the accomplishment of these objectives, it is necessary to use newer research methods which are beyond the scope and objectives of the procedures in Standard Methods. The testing methods include the elevated temperature test which indicates the fecal or non-fecal origin of coliform bacteria and the streptococcal method as an indicator of pollution. Both of the procedures and their interpretation have been established by detailed research investigations on the distribution of indicator microorganisms in feces as well as in other environments (3,4,5,6,7,8).

METHODS OF EXAMINATION

Bacteriological procedures used in the examination of stream samples are shown in Chart 8 following Page 17. Procedures which are marked with an asterisk are described in Standard Methods while unmarked methods represent tests not described and are the product of recent research studies.

DISCUSSION OF TESTS

Stream samples are collected and examined for the coliform group according to the procedures described in Standard Methods. These procedures include the use of lauryl tryptose broth for a screening test and confirmation of the presumptive positive tubes in brilliant green bile lactose broth. This is considered preferable to the lactose broth option in the presumptive test. The "Confirmed Test" enumerates the coliform group in the sample but yields no information as to probable source, such as being derived from feces, soil, plants, etc.

Elevated Temperature Test (EC) at 45° C.

The procedure for the Elevated Temperature Test consists of the following steps:

1. Transfer a loop of broth from the positive presumptive tube to an EC broth tube containing an inverted vial to indicate gas production.
2. Place the inoculated EC tube, within less than 30 minutes after planting, in a water bath at 44.5 - 45.0°C.
3. Incubate at 44.5 - 45.0° C. for 24 (± 2) hours in water bath.
4. Record the presence or absence of gas in the inverted vial.

The presence of gas in the inverted vial is a positive reaction indicating that coliforms derived from the gut of warm-blooded animals (fecal coliforms) were present in the sample. Absence of gas indicates the absence of fecal coliforms in the tube since the members of the coliform group derived from non-fecal sources generally fail to produce gas in this medium at 44.5 - 45.0° C. The fecal coliform density is calculated on the number of positive and negative tubes in the series in the same manner as for the coliform group MPN.

Streptococcal Colony Count

Streptococcal enumerations are made by the membrane filter technique using KF Streptococcus Agar as nutrient substrates. The medium is prepared as follows:

1. Mix 7.64 grams of KF Streptococcus Agar (Difco 0496) with 100 ml sterile distilled water in a sterile flask.
2. Place the flask containing the mixture in a boiling water bath to dissolve the medium containing the agar.
3. After solution is complete, continue heating in the boiling water bath for five (5) minutes.
4. Cool medium to between 50 - 60° C.
5. Add one (1) ml of sterile aqueous solution of one (1) per cent TTC (triphenyl-tetrazolium chloride)* solution and mix.
6. Pour from 5 - 8 ml of melted medium in each sterile plastic petri dish (Falcon No. FD5012) and replace lid until medium hardens.

The medium is ready for immediate use or may be used at any time within 30 days, provided it is stored in a dark place and no evaporation has occurred during storage.

---

* 2,3,5-triphenyl-tetrazolium chloride No. 6533, Eastman Organic Chemicals, is recommended. Do not autoclave solutions of this compound.

The procedure for the test consists of:

1. Filter an appropriate quantity of sample through the membrane filter.

2. Place filter on KF Streptococcus Agar, grid side up, using care to have no air bubbles between the membrane filter and agar surface.

3. Incubate at 35° C. for 48 hours (up to 72 hours is permissible).

4. Count all red or pink colonies, using a magnification of 10 - 20 diameters.

5. Calculate count per unit volume as streptococcal colony count per unit (usually 100 ml or 1 ml) volume.

The group of streptococci which meet the above definition are always found in feces and has little or no ability to produce aftergrowth in the stream. They are present in greater numbers than the coliform group in the feces of most domestic animals, while the coliform group outnumber the streptococci in human excreta.

Fecal streptococci, like the fecal coliform group, is interpreted to indicate fecal pollution. As the numbers of the indicators increase, the quantity of fecal pollution increases. However, each should be considered as an independent indicator of pollution. Survival rates of each group vary under any specific environment and may vary greatly from environment to environment. Conditions may exist where one or the other indicator may die at a greatly accelerated rate.

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3. Geldreich, E. E., et al. "The Coliform Group, II." "Reactions in EC Medium at 45° C." Appl. Microbiol., 6: 347 (1958).

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APPENDIX D

REDUCTION OF POTENTIAL POLLUTION BY BEET SUGAR PLANTS - WASTES DISCHARGED DURING NOVEMBER 1961 STUDY

REDUCTION OF POTENTIAL POLLUTION BY BEET SUGAR PLANTS - WASTES DISCHARGED DURING NOVEMBER 1961 STUDY

At the Torrington, Wyoming, Holly Sugar Company plant (19) (HT-208.8), a number of changes have occurred since 1950. Among these changes have been the following that have reduced the potential waste load to the river:

1. Ponds have been provided to receive the lime and Steffen wastes.
   Ponding of the lime waste was started in 1954.
   Ponding of Steffen waste started in 1956, and several additions have been made since that time.
2. Installation of a traveling screen in 1956. This screen is in the main sewer as it leaves the factory building. It is estimated that this screen removes 60 tons of material per day from the main sewer.
3. In 1955 a shaker screen was installed to rescreen the pulp silo waste. Additions were made to this unit in 1960. It is estimated that this screen removes 60 tons of pulp per day from the pulp silo waste that originally discharged to the river.
4. In 1960 a septic tank was installed to handle the plant's sanitary wastes prior to discharge to the plant sewer.
5. In 1961 a fine screen was installed in the main sewer between the factory and the plant outfall to the river.

The principal wastes discharged from the Torrington plant during November included:

1. Flume Water.
2. Pulp Screen Water.
3. Pulp Press Water.
4. Pulp Silo Drainage.

The Great Western Sugar Plant located at Mitchell, Nebraska (20) (GM-184-1.5) is the first sugar plant on the North Platte as the river flows from Wyoming into Nebraska. This plant is a non-Steffen operation. Measures beneficial to pollution control at this plant include:

1. Use of a Pulp Dryer.
2. Reuse of Pulp Screen and Pulp Press Water as Process Water.
3. Removal by settling, of the heavier material from the Flume Water.

The principal wastes from this plant include:

1. Flume Water.
2. Lime Wastes.

The next Great Western Plant downstream is the Gering (16) (GG-173-1.5) plant. This plant includes a Steffen house. Measures taken that have reduced pollution include:

1. Use of a Pulp Dryer.
2. Lime Wastes discharged to a pond, with no discharge to the river.
3. Removal of Steffen waste from the sewer. (This waste is concentrated and sent elsewhere for additional processing).
4. Reuse of the Pulp Screen and Pulp Press Water as Process Water.

The principal waste discharged from this plant is flume water.

The next Great Western plant is the one at Scottsbluff (21) (GS-173.8-3.0). This plant is the largest of the Great Western plants in this reach of the North Platte River. It includes a Steffen house. Wastes have been reduced by:

1. Eliminating the Steffen waste from the plant wastes. The Steffen waste is pumped from this plant to the Gering plant where it is evaporated and sent elsewhere for additional processing.
2. Pulp screen water is returned as Process Water.

Wastes from the Scottsbluff plant include:

1. Flume Water.
2. Pulp Silo Drainage.
3. Lime Waste.

The Great Western plant at Bayard is the last plant downstream in the Torrington to Broadwater reach of the river. The plant is a non-Steffen operation. In-plant waste reduction has been accomplished by the use of pulp dryers. Principal waste discharges from the plant include:

1. Flume Water.
2. Lime Wastes.

Treatment facilities are provided for the wastes discharged from this plant by a broad-field irrigation system (or grass field aeration system). The plant waste discharges to a ditch that transports the waste to a pump house. A coarse, manually-cleaned, bar screen is provided across the ditch as the waste discharges to the pump house well. An overflow pipe is provided in the waste ditch, just ahead of the screen, to prevent flooding when the screen clogs. The overflow pipe permits the discharge of some untreated wastes directly to an adjacent canal. The waste entering the pump house well is pumped across the canal to the broad-field distribution system. The waste discharged to the field flows across the field where aeration and settling occur. A collection ditch across the lower end of the field collects the treated waste and discharges it to the canal.

The material included here on treatment facilities and process changes may not include all changes beneficial to pollution control, but includes those with the greatest significance.

ATTENDANCE ROSTER

CONFERENCE ON INTERSTATE POLLUTION
Cheyenne, Wyoming

March 21, 1962

Ames, Frank C.	U. S. Geological Survey Denver, Colorado
Anderson, Pat	Tribune Cheyenne, Wyoming
Applegate, L. G.	City Superintendent Torrington, Wyoming
Bauer, Martin A. Jr.	U. S. Public Health Service Denver, Colorado
Browning, J. E.	Holly Sugar Corporation Colorado Springs, Colorado
Burk, H. D.	Nebraska Water Pollution Control Council & Great Western Sugar Company Scottsbluff, Nebraska
Burke, Howard L., Mrs.	League of Women Voters Cheyenne, Wyoming
Burwell, Earl G.	Wyoming Stream Pollution Control Advisory Council Casper, Wyoming
Carswell, Keith	U. S. Public Health Service Denver, Colorado
Christensen, S. A.	Member, Wyoming Stream Pollution Control Advisory Council
Clare, Herbert C.	U. S. Public Health Service Kansas City, Missouri
Clark, Harold F.	U. S. Public Health Service Cincinnati, Ohio
Croghan, I. D.	Plant Superintendent, Holly Sugar Corporation, Torrington, Wyoming

Day, K. P.	Wyoming Stream Pollution Control Advisory Council Saratoga, Wyoming
Detmer, John G.	U. S. Department of Health, Education and Welfare Denver, Colorado
Engendorff, O. Henry	Wyoming Department of Agriculture Cheyenne, Wyoming
Filipi, T. A.	Nebraska Department of Health Lincoln, Nebraska
Fitzpatrick, Joseph W.	U. S. Public Health Service Denver, Colorado
Gibson, W. A.	City Council, City of Torrington Torrington, Wyoming
Green, David P.	Wyoming Department of Public Health Cheyenne, Wyoming
Green, David P., Mrs.	Cheyenne, Wyoming
Hanson, C. M.	Holly Sugar Corporation Colorado Springs, Colorado
Hunsinger, Richard G.	U. S. Public Health Service Kansas City, Missouri
Jenkins, R. M., Jr., Mrs.	League of Women Voters Warren Air Force Base, Wyoming
Jensen, Lloyd T.	Great Western Sugar Company Denver, Colorado
Kittrell, F. W.	U. S. Public Health Service Cincinnati, Ohio
Konselman, Albert S.	Bureau of Mines, Denver Federal Center Denver, Colorado
Kuh, Peter	U. S. Public Health Service Washington, D. C.
Leeright, J.Robert.	Associated Press Cheyenne, Wyoming

Long, Frank E.	Wyoming Stream Pollution Control Advisory Council Buffalo, Wyoming
Ludwig, Russell G.	Engineering-Science, Inc. Arcadia, California
McGuire, Raymond E.	Corps of Engineers, Omaha District Omaha, Nebraska
McKown, Russell L.	National Park Service, Region II Omaha, Nebraska
Marshall, Donald W.	U. S. Public Health Service Kansas City, Missouri
Neel, Joe K.	U. S. Public Health Service Kansas City, Missouri
Ogilvie, J. L.	Bureau of Reclamation, Region VII Denver, Colorado
Parenteau, Louis	Colorado Department of Public Health Denver, Colorado
Peryam, John	Wyoming Stream Pollution Control Advisory Council Encampment, Wyoming
Peterson, Larry	Wyoming Game & Fish Commission Casper, Wyoming
Rogers, Dr. E. A.	Director Nebraska Department of Health Lincoln, Nebraska
Rooney, John L.	Cheyenne, Wyoming Representing Senator J. J. Hickey
Samson, John S.	Chairman Nebraska Water Pollution Control Council Omaha, Nebraska
Sidio, A. D.	U. S. Public Health Service Cincinnati, Ohio

Spring, Verne B., Mrs.	League of Women Voters Cheyenne, Wyoming
Stein, Murray	U. S. Public Health Service Washington, D. C.
Tennant, Don	U. S. Fish & Wildlife Service Grand Island, Nebraska
Townley, Donald A.	U. S. Public Health Service Kansas City, Missouri
Twyford, W. R., Mrs.	League of Women Voters Cheyenne, Wyoming
Wiard, Leon A.	U. S. Geological Survey Cheyenne, Wyoming
Williamson, Arthur E.	State Sanitary Engineer Wyoming Department of Public Health Cheyenne, Wyoming
Williamson, Arthur E, Mrs.	League of Women Voters Cheyenne, Wyoming

SUMMARY OF CONFERENCE
(SECOND SESSION)

POLLUTION OF THE INTERSTATE WATERS
of the
NORTH PLATTE RIVER
(WYOMING-NEBRASKA)

MARCH 21, 1962

The second session of the Conference in the Matter of Pollution of the Interstate Waters of the North Platte River in Nebraska and Wyoming was held on March 21, 1962 at the State Highway Department Auditorium, Cheyenne, Wyoming, under the provisions of section 8 of the Federal Water Pollution Control Act (33 U.S.C. 466 et seq.). A summary of the first session held September 12, 1961, is attached hereto and made a part thereof.*

The North Platte River rises in Jackson County in Colorado from whence it flows northerly into the State of Wyoming. It then follows the pattern of a large loop, flowing through southeastern Wyoming, northerly, easterly, and southeasterly, and crosses the Wyoming State line near Torrington, Wyoming, into Scotts Bluff County, Nebraska. It courses through the southerly part of the State of Nebraska until it is joined by the South Platte River in Lincoln County, Nebraska. As the Platte River, it continues easterly across Nebraska to its confluence with the Missouri River below Omaha, Nebraska. The North Platte River Basin embraces an area of approximately 32,000 square miles extending from north central Colorado to southeastern Wyoming and western Nebraska, and the river's waters are used for a number of beneficial purposes, including irrigation, industrial application, fishing, boating and other recreational uses. It is a potential source of municipal water supply.

*Summary of first session follows transcript of first session.

The following conferees representing the State water pollution control agencies of Wyoming and Nebraska, and the Department of Health, Education, and Welfare, attended the second session of the Conference:

E. A. Rogers, M.D.	Nebraska Department of Health
John S. Samson	Nebraska Water Pollution Control Council
S. A. Christensen	Wyoming Stream Pollution Control Advisory Council Evanston, Wyoming
Arthur E. Williamson	Wyoming Department of Public Health
Herbert C. Clare	U.S. Department of Health, Education, & Welfare Kansas City, Missouri
Murray Stein, Chairman	U.S. Department of Health, Education, & Welfare Washington, D.C.

Also participating in the second session of the Conference were the following:

Frank C. Ames	U.S. Geological Survey Denver, Colorado
J. E. Browning	Holly Sugar Corporation Colorado Springs, Colorado
Harold D. Burk	Great Western Sugar Company Scottsbluff, Nebraska
Earle G. Burwell	Wyoming Stream Pollution Control Advisory Council Casper, Wyoming
Harold F. Clark	U.S. Department of Health, Education, & Welfare Cincinnati, Ohio
I. D. Croghan	Holly Sugar Corporation Torrington, Wyoming

Kenneth P. Day	Wyoming Stream Pollution Control Advisory Council Saratoga, Wyoming
O. Henry Engendorff	Wyoming Stream Pollution Control Advisory Council Cheyenne, Wyoming
T. A. Filipi	Nebraska Department of Health Lincoln, Nebraska
Joseph W. Fitzpatrick	U.S. Department of Health, Education, & Welfare Denver, Colorado
C. M. Hanson	Holly Sugar Corporation Colorado Springs, Colorado
Lloyd T. Jensen	Great Western Sugar Company Denver, Colorado
Albert S. Konselman	U.S. Bureau of Mines Denver, Colorado
Frank E. Long	Wyoming Stream Pollution Control Advisory Council Buffalo, Wyoming
Russell G. Ludwig	Holly Sugar Corporation Arcadia, California
Raymond E. McGuire	U.S. Corps of Engineers Omaha, Nebraska
Russell McKown	U.S. National Park Service Omaha, Nebraska
Joe K. Neel	U.S. Department of Health, Education, & Welfare Kansas City, Missouri
J. L. Ogilvie	U.S. Bureau of Reclamation Denver, Colorado
John T. Peryam	Wyoming Stream Pollution Control Advisory Council Encampment, Wyoming

John J. Rooney	Representing Senator J.J. Hickey Cheyenne, Wyoming
A. D. Sidio	U.S. Department of Health, Education, & Welfare Cincinnati, Ohio
Don Tennant	U.S. Fish & Wildlife Service Grand Island, Nebraska

The Chairman of the Conference pointed out that:

1. Under the Federal Water Pollution Control Act pollution of interstate waters which endangers the health or welfare of persons in a State other than that in which the discharges originate is subject to abatement under procedures prescribed by section 8 of that Federal Act.

2. The first step of this procedure is the calling of a conference.

3. The purpose of the conference is to bring the States and the U.S. Department of Health, Education, and Welfare together to review the situation, to lay a basis for future action by all parties concerned, and to give the States and localities an opportunity to take any remedial action which may be indicated under State and local law.

4. This is the second session of the Conference in the Matter of Pollution of the Interstate Waters of the North Platte River involving the States of Wyoming and Nebraska.

5. At the first session of the Conference it was agreed that the Department of Health, Education, and Welfare, in cooperation with the State agencies, municipalities and industries involved, would conduct an investigation and study of the river during the current 1961-62 sugar beet campaign to obtain bacteriological, biological, chemical, stream flow, and other pertinent data, in order to assess properly the sources of industrial and

municipal wastes, the kinds of coliform bacteria present in the river, and their effects on water quality. That investigation and study has been completed.

6. The purpose of this session of the Conference is to consider the results obtained by the study and investigation and to agree on action to be taken to abate pollution in the North Platte River.

In the light of Conference discussions, the following conclusions were reached and recommendations made:

1. The investigation and study substantially supports the recommendations made at the first session of the Conference and confirms its conclusions which are incorporated herein and made a part hereof.

2. Findings in the study indicate that discharges of industrial wastes from a plant in Torrington, Wyoming, sewage from Lyman, Morrill, Scottsbluff, Gering, Minatare, Melbeta, Bayard, and Bridgeport, Nebraska, and industrial wastes from plants at Mitchell, Gering, Scottsbluff, Bayard, Nebraska and vicinity, pollute this stretch of the river so as to interfere with aquatic life, use of the river for recreation, fishing, boating, aesthetic enjoyment, and as a potential source of municipal and industrial water supply.

3. Adequate waste treatment facilities installed in Wyoming to abate pollution of the river as it crosses the State line and the installation of waste treatment facilities to treat adequately the municipal and industrial wastes being discharged into the river from sources in Nebraska, are both needed to abate pollution of the North Platte River.

4. Cognizance was again taken of progress made by sugar beet plants in Wyoming and Nebraska in treating their industrial wastes. However, the

objective sought is improvement of the water quality of the river so as to allow its full use for fishing, as a wildlife habitat, for recreational purposes, and as a potential source of water supply for municipal and industrial uses.

5. Holly Sugar Company at Torrington, Wyoming,will proceed with the necessary pipeline, pumping, and percolation ponds or equivalent to provide for disposal of sewage and industrial wastes in order to keep out of the river pulp screenings, silo drainage, and septic tank discharges, and to devise a method for efficient screening of the final waste effluent. These remedial facilities are to be in operation by the beginning of the 1962-63 sugar beet campaign.

6. The Nebraska Department of Health will provide a voluntary effective program to control pollution of the North Platte River in Nebraska.

7. A program for sampling, analyzing and monitoring the effects of discharges from the industrial sources on the river from Torrington, Wyoming to Broadwater, Nebraska, will be established and in operation by the beginning of the 1962-63 sugar beet campaign. The program will include but not be limited to analysis of dissolved oxygen, B.O.D., suspended solids and the nature of bacteria present.

The Federal government has an obligation in connection with that program,but industry should be given an opportunity to inaugurate and conduct this activity in cooperation with the State water pollution control agencies. Accordingly, the Wyoming Department of Public Health and the Nebraska Department of Health will furnish the Department of Health, Education, and Welfare details of the program by August 1, 1962, so that the Department of Health, Education, and Welfare can evaluate the situation.

It is understood the Department of Health, Education, and Welfare will be called upon in the event the monitoring program indicates the presence of fecal streptococci or fecal coliforms.

8. At the end of the 1962-63 sugar beet campaign all parties concerned will evaluate the accomplishment and effectiveness of the program agreed upon with a view to determining the need for another session of the Conference.